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THEW LORAIN 55 60 75

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Do you mention the CONTRACTORS AND ENGINEERS MONTHLY when writing? Please do.

Vol. XVIII
No. III

Contractors and Engineers Monthly

March,
1929

Building Watertight Sewers in Westchester County

By James C. Harding, Jr.,
Consulting Engineer, New York

WESTCHESTER COUNTY, having established an enviable reputation for leadership in the construction of county parks and parkway systems, is now taking up the equally important problem of county trunk sewers and disposal works planned and constructed under the supervision of the Westchester County Sanitary Sewer Commission, a body created by an act of Legislature and appointed by the County Board of Supervisors. Plans have been prepared by the Commission's Consulting Engineer, W. W. Young, embracing trunk sewers with screening and chlorination plants for the entire county.

Mamaroneck Trunk Sewer

One of the first projects to be undertaken by the Commission is the Mamaroneck trunk sewer. When completed it will cost, together with the disposal works, some $6,000,000. Before the Commission was ready to place this entire project under contract, it was deemed necessary to lay some 12,000 feet of pipe at once, inasmuch as this section of the sewer parallels the new Hutchinson River Parkway which was at that time being constructed by the Westchester County Park Commission. Delay would have meant that considerable expense would have been necessary to replace the park property damaged by sewer construction. Accordingly, bids were asked for on four sections of this line and were opened on February 16, 1928. Antonio DiMarco, of White Plains, N. Y., was the successful bidder on all four sections. The work embraced under these contracts was the complete construction of a precast concrete sewer line, some 12,000 feet long and varying in diameter from 30-inch to 48-inch, together with the necessary manholes, stream crossings and various appurtenances. The route of the sewer parallels closely the Mamaroneck River and runs partly through the grounds of the new Maple Moor Golf Course, which was built and is operated by Westchester County, and partly along the edge of the pavement of the Hutchinson River Parkway. This necessitated taking great care to preserve and protect from damage trees, shrubbery, fairways, etc. Access to the work was possible over the subgrade already placed for the concrete pavement of the new parkway. This subgrade was soft and, particularly during wet weather, was impassable for trucks.

8-Foot Pipe Lengths Used

As the Mamaroneck River is used as a source of water supply by the Village and Town of Mamaroneck and the Town of Harrison, the engineers were compelled to secure watertight work not only as a safeguard against infiltration, but to preclude any chance of sewage seeping out of the pipe line and polluting

A View of the Completed Westchester Sewer Before Backfilling, Showing Excellent Grade and Line Secured

Two Northwest Model 105 Machines Working in Rock on the Westchester Sewer. One of the Machines is Equipped as a Pull-Shovel and the Other as a Crane

the water supply. To reduce the number of joints the Sewer Commission insisted on the use of 8-foot lengths instead of the standard 4-foot lengths of pipe. This meant that no pipe could be purchased from stock, and accordingly a plant was erected at a central location on the ground and the pipe manufactured there. This pipe was made by the Independent Concrete Pipe Co., of Indianapolis, and was for the most part hauled a distance of from 1,000 to 8,000 feet to the trench on a specially constructed stone boat drawn by a Cleveland tractor.

EXCAVATION

Excavation varied in character ranging from 20-foot rock cuts to quicksand. The method pursued in excavating the trenches was as follows: first top soil to a depth of about one foot was stripped and placed one side with a No. 105 Northwest shovel, using a 1-cubic yard pull-shovel attachment. After it had removed the top soil a sufficient distance ahead, it dug the trench to approximately the invert grade of the pipe, where ground conditions permitted. Quite frequently it was necessary to place sheathing and in such cases this shovel only excavated to a depth where caving in of the banks was an important factor. When this depth had been reached the trench was sheathed with 2 x 10-inch short leaf yellow pine driven with an Ingersoll-Rand sheathing hammer. Since it was necessary to excavate for and place pipe between the bracing, 20-foot rangers were used with cross-braces every 10 feet which permitted opening the bucket to its full width. The remaining excavation was removed with a General excavator having a crane attachment and ½-yard clamshell bucket. This machine was also used to trim the excavation made with the Northwest and to place the 8-inch vitrified underdrain with its surrounding crushed stone. Where rock was encountered it was drilled and blasted and then removed with the pull-shovel. At one particular point where rock had to be excavated to a depth of 20 feet, one 3-hammer Chicago-Pneumatic compressor and one 2-hammer and one 3-hammer Ingersoll-Rand compressors with seven drills were used.

CONSTRUCTION AT STREAM CROSSINGS

The most difficult parts of the excavation were the stream crossings. The method of making these was as follows: a coffer-dam was constructed of two lines of tongue and groove sheathing with earth placed between the rows to insure watertightness. This coffer-dam was placed one-half of the way across the stream and then after the pipe had been laid and the trench backfilled, a concrete bulkhead was placed to prevent water from the stream rushing back through the underdrains and the freshly compacted backfill. After this had been done the stream was diverted back over the trench and a coffer-dam constructed from the other side of the stream to the pipe. This method worked successfully.

In order to permit crossing from either side the top of the sewer is placed lower than the bed of the stream, and during times of severe storms it was expected that the trench would be flooded. This happened on three occasions but no serious damage was done. At one time the brook broke through the side of the trench and rushed down the line of trench to such an extent that the brook itself was practically dry. This break was repaired in about 18 minutes by first throwing planking across the opening and then placing canvas and finally earth over the planking.

DRY TRENCH NECESSARY

Inasmuch as the pipe was placed on a concrete cradle and joints made with cement mortar any rise of water in the trench while the concrete was setting would have done considerable damage to joints and probably neces-

Northwest Pull-Shovel Operating in a Rock Cut

sitated the relaying of sections of the pipe line. Accordingly great care was exercised to secure a dry trench. This was done by placing an 8-inch underdrain the entire length of the sewer and surrounding it with crushed stone which was kept from entering the joints by wrapping with burlap. A 600-gallon per minute LaBour centrifugal pump was placed in the lower manhole on the line and connected to the underdrain. In addition to this nine other pumps including one 4-inch Barnes centrifugal and eight 4-inch Barnes diaphragm pumps, were used along the trench line and were kept going day and night. To the efficiency of this method of handling the water Mr. DiMarco attributes the fact that he found it unnecessary to dig up a single pipe or to replace any joints. In this connection it should be remembered that the pipe was placed lower and immediately adjacent to the brook and for the most part in a porous soil.

Method of Laying Pipe in Trench

In laying the pipe, first tar paper was placed on top of the crushed stone surrounding the underdrain, and then a precast concrete saddle shaped accurately to fit the outside of the pipe was set to line and grade and embedded in concrete. Each length of pipe when laid had one end resting on the joint of the previous section and one end on this concrete saddle. After the pipe had reached its final position a concrete mat was placed on top of the tar paper and around the pipe to prevent settlement and protect alignment. The precast concrete saddle saved considerable time in raising and lowering the pipe to get it exactly to grade and also secure better construction, because a more even bearing was secured by placing concrete around the pipe than could have been obtained by setting the pipe on concrete which had already become set.

The pipe, weighing up to four tons per length, was as a rule placed with a Northwest No. 105 having a crane attachment, although in a few cases where the machine with the dipper arm was nearer it was used for this purpose.

Jointing

In making joints, the bottom of the joint of the pipe which was already in position was covered with cement mortar. The adjoining pipe was then placed and the joint surrounded on the outside from the bottom to the spring line with 1:2:4 concrete placed in a wooden form and extending one foot each side of the joint. The joint on the arch of the pipe was covered on the outside with cement mortar. After the joint had been made on the outside it was plastered on the inside with first a rough coat and then a smooth coat of cement mortar. All cement used for the joints was Vulcanite Super Cement. In the hot weather it was necessary to protect all joints by moistening and covering.

Pipe was tested in sections of from 500 to 600 feet by bulk-heading the ends of the line and filling the pipe with water. The pressure was increased by building a riser of vitrified pipe some 4 feet above the crown and bringing the water up to this level. The specifications limited the allowable leakage in any 500-foot section to 500 gallons per day per 50 square yards of inner surface.

The extreme care taken in laying this pipe is responsible for the fact that the actual leakage from 12,000 feet totalled only 20 per cent of the amount allowed under the Engineer's stringent leakage clause. The insignificance of this amount can be readily visualized when it is considered that it represents about one-thousandth of the carrying capacity of a 48-inch pipe and would only cover the invert of the pipe line at its lower end to a depth of 5/8 inch.

General Excavator With Clamshell Handling Sewer Excavation

Backfilling

It was necessary to run the trenching machinery over the excavated material to such an extent that it was rather firmly compacted and ordinary backfilling equipment would have been inadequate for its removal. One of the Northwest 105 shovels was equipped with a high-lift dipper arm attachment and used to backfill the trenches.

Time Limit on Work

The total amount of the work was approximately $450,000 and was divided into four sections, one section of which was sublet to Joseph Meile. The contracts were awarded on February 20, and work was started on Section D on February 26. They called for Sections D and F to be completed on May 15 so that the Park Commission could proceed with the work of concreting the subgrade.

As the pipe had to be cast specially for this job none was available until April 15, when 2,800 feet of trench was open and ready to receive it. This pipe was all laid in a period of two weeks, and the job completed before the time limit had expired. Section F was completed on June 15, Section D on September 15 and Section E on December 8.

Equipment and Personnel

The equipment used by the contractor on this work included: 2 Northwest No. 105 cranes equipped with pull shovel, crane and high-lift shovel attachments; 1 Keystone excavator; 3 General excavators; 3 Rex one-bag concrete mixers; 1 Caterpillar Thirty tractor; 10 pumps; and 3 air compressors.

The average number of men employed on the work

was 45. F. J. Laverty was Assistant Engineer in charge of the work and E. C. Hallock, F. Crisfield and J. E. Hamilton were the Inspectors for the county.

A Concrete Bank Vault Blasted Out Close to Traffic

RECENTLY it became necessary to remove a large concrete bank vault in the heart of the business section of West Chester, Pa. The work was necessarily done without the interruption of street traffic, or retail trade in the immediate vicinity. With the exception of an occasional explosion no louder than that made by a cannon cracker, passers-by would not have realized that the heavy walls and roof of the vault were being demolished.

The vault had been constructed for the National Bank of Chester County and was used during the institution's temporary occupancy of a storeroom and dwelling while a new bank building was being built. J. J. McGinley of East Mauch Chunk, Pa., was in charge of the blasting, which was done for Tilghman Moyer Co., contractors and engineers, Allentown, Pa.

The interior dimensions of the vault were 8 feet by 20 feet with a height of 8 feet. The walls and roof were 18 inches thick and were reinforced with steel rods.

Charges of 40 per cent dynamite, 2¼ inches long, were loaded in holes 9½ inches deep on 2-foot centers. Each hole was tamped to the top with clay. The shots were detonated in series of three with an electric blasting machine. About 25 pounds of dynamite were used in approximately 180 holes to complete the job.

After the side walls had been reduced in sections to mere shells which could be broken through with a pick, the thickness of the roof was similarly reduced by shooting from within. During the blasting of the side walls, the reinforced roof was supported at the front end by a steel girder, while support at the rear was provided by the end wall, through which a sizeable hole was blasted to permit the escape of fumes from the blast, yet left reinforced columns of sufficient section to bear the burden of the roof from that end.

A barricade of heavy timbers was placed around the two sides and the end of the vault as a precaution to protect adjoining property on one side and the end, and to safeguard passing pedestrians and automobiles parked at the curb within a few feet of the street side of the vault. The use of the barricade proved unnecessary, as no fragments of the concrete were scattered outside the vault by the blast. All windows throughout the building, of which the vault was virtually a part, were left open a few inches at both the top and bottom and not a single pane of glass was broken by the blast. Even within the building itself, not the slightest vibration was felt when the shots were fired.

Our Front Cover

THE photograph reproduced on the front cover of this issue of CONTRACTORS AND ENGINEERS MONTHLY was furnished through the courtesy of the Killefer Mfg. Co., Los Angeles, Calif. The photograph shows a Caterpillar Sixty pulling a Killefer rotary scraper on a road grading project.

The Building Which Housed the Vault of the Bank of Chester County, West Chester, Pa., Showing the Barricading to Protect Adjacent Property. At Right, Loading the Holes in the Vault Preparatory to Blasting

Fifth Annual New England Road Show in May

THE Fifth Annual Contractors' and Roadbuilders' Machinery Open Air Show under the auspices of the Massachusetts Highway Association will be held at the usual place at Memorial Drive near Cottage Farm Bridge, Cambridge, Mass., on May 7, 8 and 9. It is expected that this year the largest working exhibition of outdoor machinery ever assembled in New England will be shown. Based on previous records, it is estimated that more than 20,000 directly interested visitors will attend this show, which will go on, rain or shine.

The Executive Committee of the Massachusetts Highway Association, under whose direction the show is run, is composed of Hon. Pehr G. Holmes, President, John M. McCarthy, Secretary, Fred W. Mattheis, Charles F. Rueter, L. H. D. Anderson, John A. Gaffey, Franklin C. Pillsbury, and Arthur H. Blackmer. F. W. Mattheis, 285 Dorchester Ave., Boston, is in charge of exhibition space.

Oklahoma Builds 10 Miles of Asphalt Top on Concrete Base

By Eugene Wheeler

Resident Engineer, Oklahoma State Highway Commission, Chandler, Oklahoma

THE H. L. Cannady Co., Tulsa, Oklahoma, was the successful bidder on Oklahoma Federal Aid Project 137, Sections A and B, in Lincoln County. This is a portion of Highway 66 of the National Transcontinental Highway. The contract was let in March, 1928, and consisted of grading and drainage structures and paving 10.74 miles between the cities of Chandler and Wellston through Warwick, with the requirement that the entire work be completed within nine months from the date of the work order.

This project was about 60 per cent over old location which had never been improved, other than grading. On each end is rolling country and in the middle a flat overflow bottom of Deep Fork Creek. As this is on the edge of the Oklahoma red beds, practically every kind of soil may be seen along the road.

During construction the road was closed and a detour provided by the Highway Department. As sections became available traffic was routed over the completed portion.

Culvert Construction

A subcontract for the drainage structures on Section A was given to E. S. Alderman, who started work on April 7. There were 2 sack mixers and 2 crews, consisting of a foreman, 2 carpenters, 1 team, 5 men and 1 truck each. Robertson & Son, to whom 2 miles of Section A covering grading and drainage structures were sublet, had 26 teams and worked 15 men on the job. Maney and Allen, of Oklahoma City, to whom grading and drainage structures on Section B were sublet, had one ¾-yard Northwest shovel, one 10-ton steam roller, 10 Western dump wagons, one air drill and the necessary small tools. They worked 26 teams and 21 men. On Section B there was one culvert crew consisting of a foreman, 2 carpenters, one team, 7 men and 2 trucks. They used a one-sack mixer and had all the necessary small tools. D. T. Allen, Henrietta, Oklahoma, to whom a portion of Section B was sublet, had 1 foreman, 20 teams, 7 dump wagons, small tools, a 10-ton steam roller, air drill and a Koehring 1-yard gas shovel.

Forty-nine culverts containing 1,088 cubic yards of concrete were completed by July 1. Good averages were made by each crew and a high quality of workmanship was maintained. Construction was so planned that at no time was the grading delayed by culvert construction.

Grading

The road bed was graded to a 30-foot crown, with ditches 15 inches deep and 2 feet wide and all back slopes on a 1½ to 1 slope. The fills were made in 1-foot lifts, leveled and rolled with a 10-ton roller. Back fills to culverts were tamped and all fills where rolling was impossible, such as in deep narrow washes, were jetted as soon as the pipe line was laid for paving. Grading on Section A and grading and drainage structures on Section B were sublet to Maney & Allen, who in turn gave Robertson & Sons a subcontract for two miles of grading on Section A, and D. T. Allen a subcontract on Section B for both grading and drainage. Grading on Section A was completed on June 24 and on Section B August 1.

Grading Quantities and Prices

The following list shows the number of cubic yards, the various materials handled in the grading operation and in the culvert work:

Earth excavation	51,381 cu. yds.	@ $0.28
Loose rock excavation	2,249 cu. yds.	@ 0.70
Solid rock excavation	8,401 cu. yds.	@ 1.25
Borrow	36,801 cu. yds.	@ 0.27
Overhaul	36,565 cu. yds.	@ 0.06
Channel change	2,441 cu. yds.	@ 0.40
Class A concrete	1,088 cu. yds.	@ 21.50
Reinforcing steel	83,960 pounds	@ 0.06
Laid up rip-rap	30 sq. yds.	@ 2.00

Clearing and grubbing were included in the excavation prices and the free haul limit was 500 feet. The bid price on Class A concrete included all excavation and removal of old structures, if any.

The pavement is a 2-inch asphalt top on a 5-inch modified Bates type concrete base, 18 feet wide and of a 1:3:5 mix. A 9 x 2-inch curb of 1:2:3 mix was run with the base.

Water Lines

A 2-inch pipe line for water for the mixer was laid and the proportioning plant was set up on a large material pile accumulated before grading was completed. Water was available at six different places along the line and two pumps were used, one to furnish water to the mixer and wet the subgrade ahead of the mixer and one for curing the base. With the mixer working between the two pumps, only one pipe line was needed. A C. H. & E. Triplex and a Barnes Triplex were used. Both pumps were not needed all of the time but were necessary when the head was high.

Batcher Plant

The first proportioning plant was set up on a spur of the Frisco Railroad at Chandler. The mixer was started at a point 3.84 miles west and the base course poured to the east end of the job at Chandler. The plant was then set up at Warwick on a spur of the Fort Smith & Western Railroad and the mixer started at the original point and the base poured to Warwick, a distance of 3.26 miles. The mixer was then moved to the extreme west end at Wellston and the base run to Warwick, a distance of 3.64 miles. Because of a few days

of bad weather which delayed the work, the base from Warwick to Chandler was old enough so that it could be used to haul over by the time the mixer had finished the base.

The asphalt plant was set up alongside the concrete proportioning plant at Warwick and the topping was started at Chandler on the day following the completion of the base. From the first set up, the dead haul was one quarter mile and from the other set up and the asphalt plant the dead haul was only a few hundred feet.

At the proportioning plant 9 men were employed, including 1 crane operator, 2 clean-up men in the cars and on material piles, 1 sack cleaner operator, 1 service truck and operator, 1 bin man and 3 men handling cement. One Erie Gas+Air crane was used for handling the aggregate and another of the same make was used when the asphalt plant was started. Johnson measuring batchers were used at the bin. A large storage platform was built for cement so that when the delivery of cement by the railroads exceeded the demand on the road it could be piled there, but most of the cement was loaded direct from the cars on to the trucks.

FINE GRADING AND FORM SETTING

The contractors used 5,900 lineal feet of Blaw-Knox forms, a Carr formline grader, a Lakewood subgrader and an Austin Pup roller, a Rex 28-E paver equipped with a mechanical man, an Ord concrete road surfacer, 2 Feigle burlap covering machines, a Koehring subgrade planer, an Avery 2-ton crawler tractor and a grader made and patented by Mr. Ward who handled the fine grading.

On the subgrade were 1 machine operator, 1 roller operator, 1 team and driver, 1 tractor driver, 1 grader man and 2 single hands. One form setter and 3 helpers kept the forms well ahead of the mixer and in good line. Two men were used to tamp under the forms and to keep the subgrade wet down ahead of the mixer.

PAVING OPERATIONS

Two men working from a platform emptied the cement onto the trucks, a short distance ahead of the mixer. Two men dumped the trucks at the mixer skip and added cement to the batches when curb batches were run. Four men shovelled concrete and spaded the edges behind the mixer and two men kept the subgrade in proper condition. Four men were used to remove, carry forward, clean, oil and set the inside curb forms. Four men carried back the cement for the curbs, while one man floated, two men finished the curb and joints, one foreman was employed to look after the curing which was handled by one man for every 600 to 800 feet of base, which was kept wet for a period of seven days by hand sprinkling. The forms were removed after 12 hours and hauled ahead at night by one man assisted by the night watchman and a helper.

Expansion joints were placed in the base, not less than 200 or more than 300 feet apart. These were 2 inches wide and were filled with hot asphalt but not tamped.

A total of 55 days was used to complete the concrete base, making an average run of 1,031.6 feet per day. The longest day's run was 1,508 feet and 98 per cent efficiency was made for the day, in hours actually run. A very high standard was maintained by the contractor throughout the job. All base and curb were straight-edged to detect high and low spots. The edgers used in finishing were 7 inches wide and the curb was materially helped by the use of this size tool.

INSPECTION

State inspectors were located, one at the plant, one on forms, subgrade and curing and one back of the mixer. Tin shingles were placed on the base at different points in every station and the thickness of the base was measured after the finishing machine had gone over it. This was a good test both for the crown and subgrade. Cylinders were made for each day's run and crushed at the end of every 28 days. The average strength at the end of 28 days was 2,680 pounds per square inch. Cores were taken from the slab in each day's run and broken for an average strength of 3,867 pounds per square inch. Average thickness shown by cores was 5.319 inches.

THE ASPHALT PLANT

The asphalt plant had a capacity of 3,000 square yards of 2-inch top per day, and the average per day throughout the job was 2,316 square yards. A timing device with a bell was used on the mixer, and batch boxes were used to regulate the mix after they had been set by weights. The weights were checked twice weekly and found to be very accurate. This saved weighing each batch and cut down on the number of men needed. In all, 10 men were used at the plant. A plant chemist from the State Highway laboratory was always on the job and in charge of the mix. Asphalt was delivered on the street at about 325 degrees Fahrenheit. It was found that a much stiffer mix could be satisfactorily handled with the machine finish than could be used with hand raking. The specific gravity of the mix averaged 2.186.

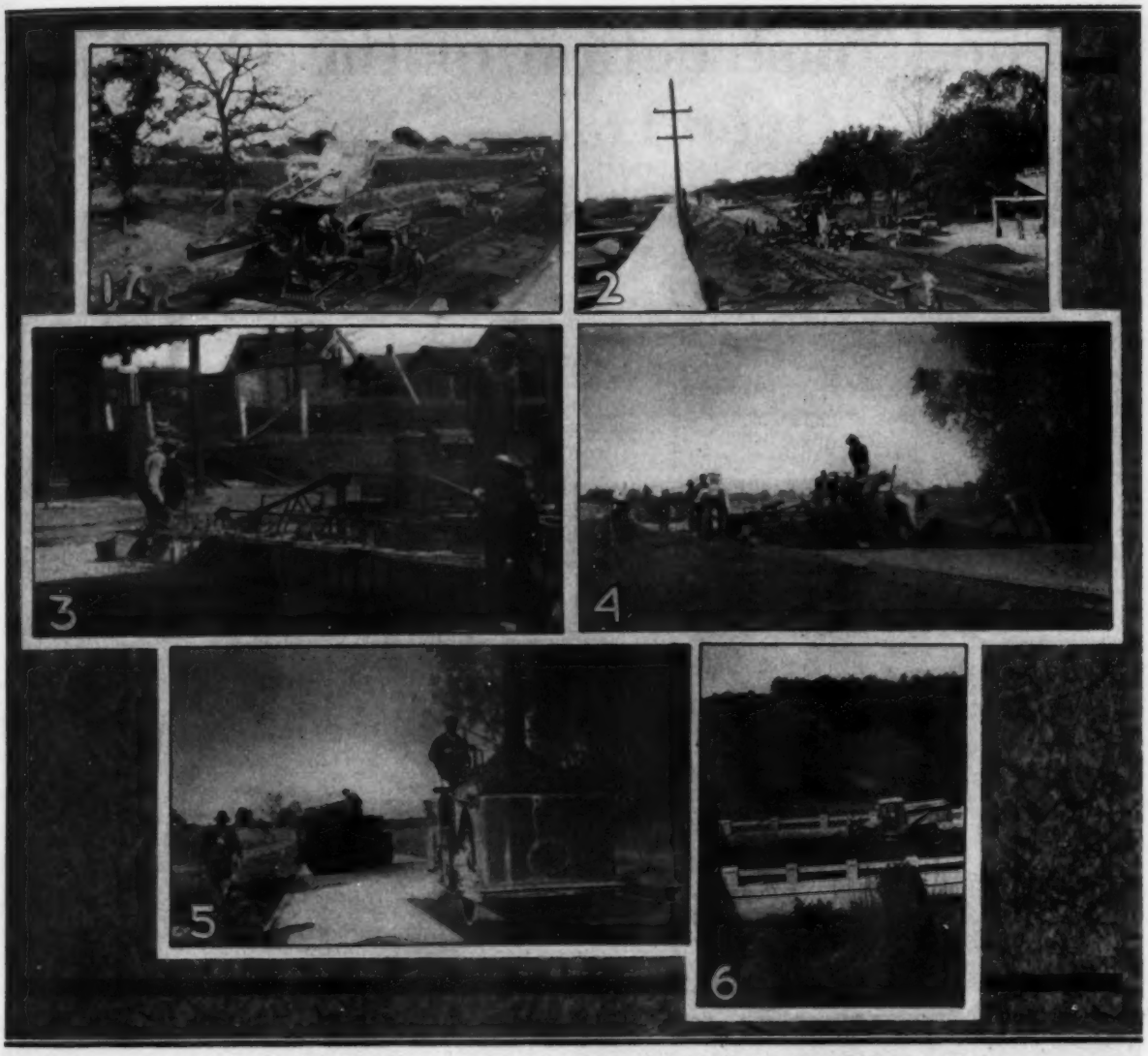
ASPHALT SURFACING

Topping began on October 1, using a Lakewood road surfacer, with a special heated screed and rake attachment for raking and surfacing the asphalt. A Buffalo-Springfield 8-ton roller was used for break down and a Kelly-Springfield 8-ton roller used for cross rolling. A heater mounted on wheels was used to heat asphalt paint for the inside of the curb and to keep the hand tools heated and clean. One man dumped the truck of rock asphalt, one painted the inside of the curb forms, 3 swept and cleaned the base, 2 rakers kept the edges clean and made the necessary patches and 6 men alternated on spreading the asphalt in front of the finishing machine.

All asphalt was turned by the shovelers and care taken to keep the material evenly spread, so that the screed carried a uniform amount in front. Straight edges were used before the break down, after the break down and after the cross rolling. An exceptionally uniform and well sealed surface was obtained in this way, only a few patches being needed.

SHOULDERS

As soon as a half mile of the road had been topped, work was started on the shoulders with a small drag line to pull the dirt into place and two teams with fresnos and a grader were used to level it off. The 6-



PROGRESS ON AN ASPHALT TOP-CONCRETE BASE ROAD AT CHANDLER, OKLA.

1. Paving plant, showing batch truck and, in background, the batching plant. 2. Only a few feet to go, the end of the pouring of the base. 3. Mechanical rake and screed on the asphalt finishing machine. 4. All asphalt was turned by hand after dumping and before the finishing machine spread it. 5. Longitudinal and cross rolling of the asphalt surface course. 6. A completed bridge on the highway

foot shoulders were then hand dressed to line. After this had been done the wire cable guard rail was placed in the necessary position.

QUANTITIES AND PRICES

The following are the quantities and prices included in the paving unit.

Base course concrete	113,274.86 sq. yds.	@ $1.72
Asphalt surface	103,869.98 sq. yds.	@ 1.16
Class A concrete	136.93 cu. yds.	@ 21.50
Reinforcing steel	11,010 pounds	@ 0.06
Wire cable guard rail	7,835 lin. ft.	@ 0.75

Materials for this highway were furnished from the following sources: crushed rock from the Hughes Stone Co., Tulsa, Okla.; sand from the Price Sand Co., Tulsa, Okla.; gravel from the Yahola Sand & Gravel Co., Muskogee, Okla.; reinforcing steel and guard rail from the Capitol Steel & Iron Co., Oklahoma City; and cement from the Atlas Portland Cement Co., Independence, Kansas and from the Oklahoma Portland Cement Co., Ada, Okla.

FULL CO-OPERATION THROUGHOUT THE JOB

The contractors and their men all worked hard for the best possible job and co-operated with the engineers at all times. The result is a road of which the contractor and the Highway Department are justly proud and answers a long felt community need. The Cannady Co., was represented by Harry L. Cannady, President, L. S. McCaslin, General Superintendent and L. O. Warner, Superintendent in charge of construction. Mr. Werner made his home in Chandler for the duration of the job. The representatives of the Oklahoma State Highway Department included L. C. Bernard, Division Engineer, Carl Reid, Construction Engineer, Dudley Wood, Chief Testing Engineer, all of Oklahoma City and Eugene Wheeler, Resident Engineer, located at Chandler.

The Construction of the Devil's River Dam, Texas

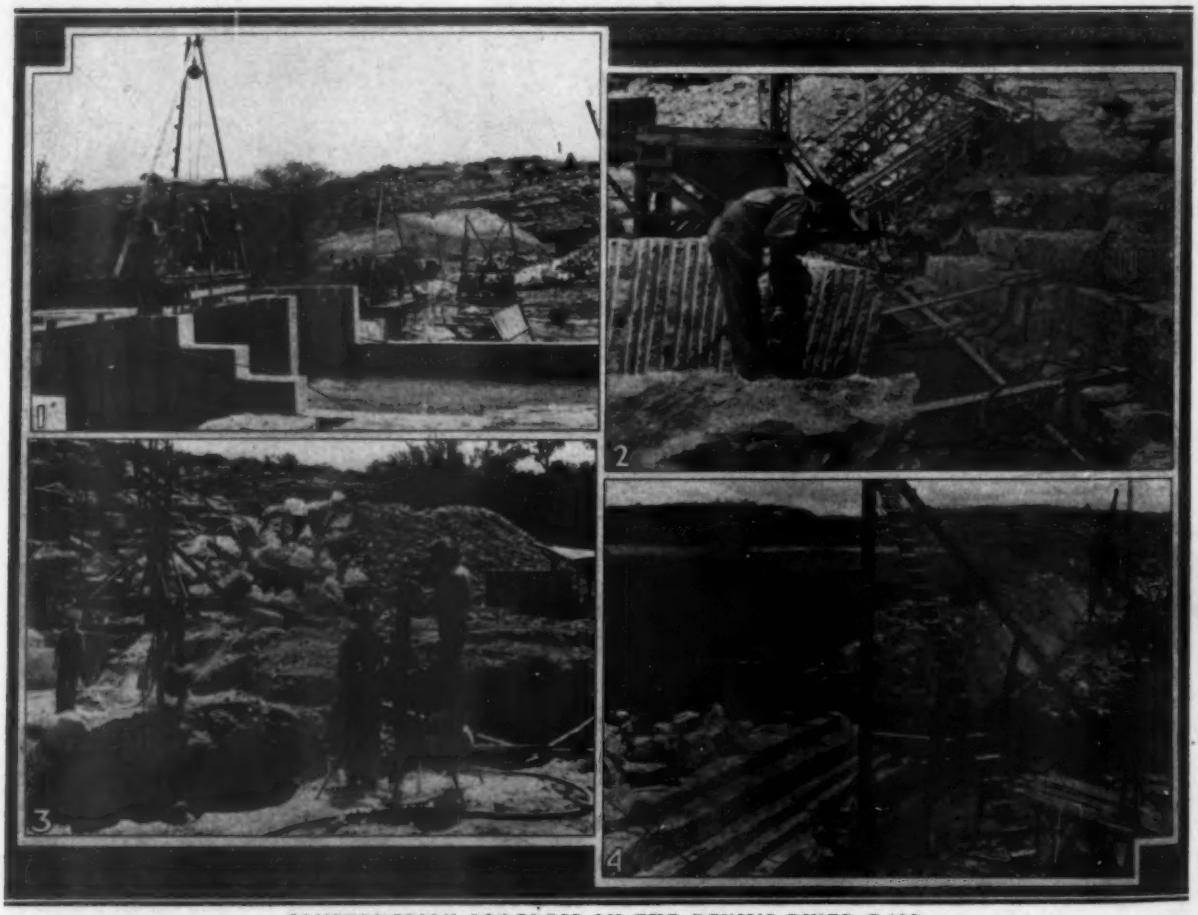
By L. E. Kelley,
Engineer, El Paso, Texas

On the Devil's River, at a point about 25 miles west of Del Rio, Texas, the Central Power & Light Co., of San Antonio, has recently completed a hydro-electric dam embodying some interesting and unusual features of construction. These features include the use of limestone masonry instead of concrete, due to the scarcity of sand, the limestone blocks being quarried from the hillside, close to the dam site. To insure against leakage beneath the dam in the bedded limestone, diamond core drills were employed to bore holes through which cement grout was pumped to fill up the cavities and crevices.

This dam is one of a series to be constructed on the Devil's River and is known as No. 1. It is 900 feet in length, 45 feet high, with a width of 43 feet at the base and 6 feet at the top in the non-overflow section. A single generating unit of 2,000 k. w. capacity has been installed in the power house.

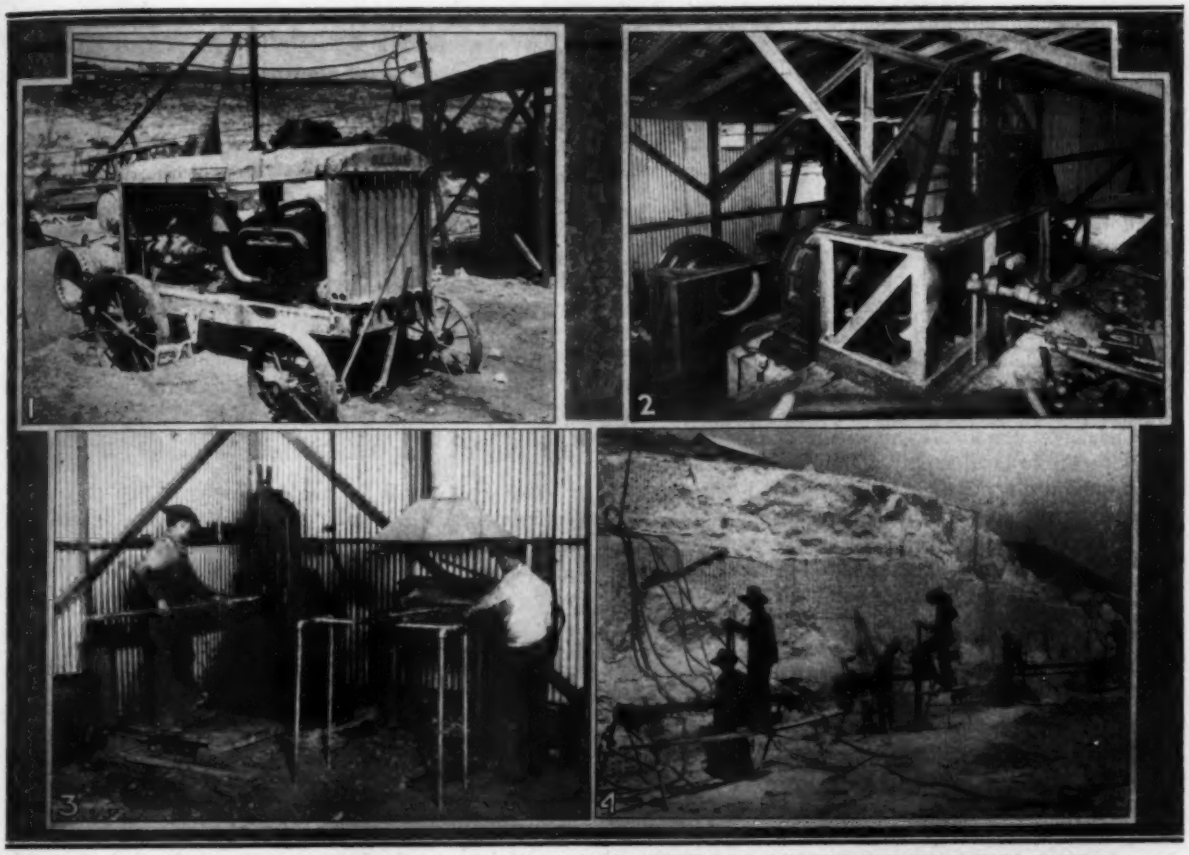
Diamond Drill Test Borings

Previous to actual construction, the dam site and foundation were carefully studied by a series of diamond core drill test holes, to insure the future safety of the dam, and determine the soundness of the rock for foundation purposes. Nine holes were drilled on the center line along the length of the dam to an average depth of 50 feet, using Sullivan Bravo-300 gasoline engine-driven diamond core drills, extracting 2-inch cores of the formation directly below the proposed dam.



CONSTRUCTION PROGRESS ON THE DEVIL'S RIVER DAM

1. Four Sullivan Bravo diamond drills running grout holes through the core wall of the dam. 2. One of the clay spaders used for cleaning the muck seams from the quarried block. 3. A T-3 drill mounted on a tripod wall channelling in the cut-off trench. 4. A view of the dam as it neared completion, showing the character of the masonry



A PART OF THE EQUIPMENT USED TO FACILITATE WORK ON THE DEVIL'S RIVER DAM

1. *The 220-foot portable compressor used on drilling work remote from the main pipe line.* 2. *Two-angle compound compressors running at 300 r. p. m. to furnish air to the main pipe line for use in the various pneumatic operations.* 3. *Sharpening and shanking the drill steel for the quarrying and cut-off operations.* 4. *The T-3 drills and quarry bars channeling masonry blocks*

These cores showed the formation was excellent for dam foundation, but a number of seams, located below the surface of the river bed, would require grouting to safeguard against leakage or seepage.

PREPARATION FOR CONSTRUCTION

The L. E. Myers Co., contractors of Dallas, Texas, and Chicago, Ill., were the successful bidders. Because of the isolated location of the project, it was first necessary to build a camp for 300 men. Every effort was made to establish a camp which would minimize the labor turnover. Various problems confronted the contractor, as it was necessary to employ a large percentage of Mexican labor, which predominates in this section of the country. Bunkhouses for the Mexicans were erected a short distance from the bunkhouses of the American laborers. A large mess hall was partitioned into two sections and solved the problem of keeping the two classes of workmen separate. A large ice box with an electric refrigerating unit was installed to keep all foods. Two modern latrines, equipped with a septic tank, provided adequate sanitation.

EXCELLENT LIMESTONE AVAILABLE

The west bank of the river is a limestone bluff, rising 180 feet from the bed of the river. The formation is known as Edwards lime, which lies in practically horizontal layers, varying from 2 to 9 feet in thickness. Two diamond core drill test holes were drilled in the bank to determine the various layers and the thickness of each layer. As a result, and because of the scarcity of sand for concrete, with attendant high cost for delivery at the dam site, it was decided to construct the dam of stone block masonry, taking advantage of these limestone layers to open a quarry.

A 15-ton cableway was erected with towers on the east and west banks of the river. The quarry site was opened in two steps on the west bank, slightly north of the cableways, and equipped with two 10-ton steel derricks, each having a boom reach of 150 feet. As this limestone formation runs about two tons in weight to the cubic yard, it was necessary to limit the size of blocks to about 4 cubic yards. The thickness of the particular layer quarried and the weight limit governed the dimensions of the blocks, so that the uniformity of the blocks varied with each new layer quarried. After the derrick placed the quarried blocks in the stock pile, located at the southern end of the quarry, the cableway then picked up the blocks and transported them to various points along the dam as needed. Actual laying of the blocks was performed by three 10-ton stiffleg derricks set on the down-stream face of the dam.

QUARRYING THE BLOCKS

The blocks were quarried by the use of ten Sullivan T-3 drills with 36-inch feed range, mounted on 10-foot

quarry bars. The quarry bar was so constructed as to permit the drilling of a straight line of holes known as "line drilling." The holes were drilled 2 inches in diameter and four holes were drilled to the foot, leaving a 1-inch web between holes. In this way practically the same results as channeling were accomplished, for the web or core was easily broken out by plugs and feathers, or with the aid of a very small amount of black powder. The drills, mounted on quarry bars, were operated by a Mexican runner and one helper and averaged 300 lineal feet of hole per drill per 8-hour shift. In one month eight of these machines drilled 150,000 lineal feet of hole or the equivalent of 28.4 miles of drill hole. The depth of holes drilled varied with the thickness of the limestone layers, the greatest depth being about 9 feet. No trouble was experienced in cleaning the holes. Practically all of the machine men were developed from local supply of Mexican labor.

To facilitate a more rapid drilling and a more accurate alignment of the drill holes, the quarry bar drills are equipped with 36-inch feed screws and shells, and also with a steel support and a retainer guide. The steel support consists of an extension arm 19 inches long, bolted to the lower end of the shell. A split steel bushing is carried at the lower end of this arm, one-half being held in the support, the other half in a cap. The cap is hinged, so that in removing drill steel it is only necessary to pull a pin and swing the cap to one side.

The drill steel used in the quarry operation was 1¼-inch round hollow steel with lugged shanks, and 4-point cross bits. The sharpening and shanking of this steel was done on a Sullivan Class A drill sharpener by a Mexican operator secured locally. The ⅞-inch hollow hexagon steel used by the rotators was also sharpened and shanked on this machine. Heating of the drill steel for forging and tempering at safe temperatures was done by an oil furnace.

Between the layers or laminations of Edwards limestone occurs a bedding plane or mud seam about ½-inch in thickness. It was necessary to clean the blocks of this material to insure a good bond for the mortar. Several tools of different types were tried for cleaning the blocks. The pneumatic spaders, equipped with bush hammers were adopted, as proving most effective for the work. One was kept in service at the foot of each derrick, handling the blocks to the stock pile.

CUT-OFF TRENCH AND GROUT HOLES

One of the first items of construction was the excavation of a cut-off trench on the up-stream face of the dam. The trench as excavated was 5 feet deep and 6 feet wide, running the entire length of the dam. Since several layers about 18 inches in thickness were found just below the surface of the river bottom, it was considered dangerous to blast this trench, due to the possibility of shattering the walls. As a result of this condition, the cut-off trench was excavated by channeling in much the same manner as the blocks were quarried. Quarry bars, equipped with T-3 cradle-mounted machines drilled a line of holes across the entire length of the dam leaving a web of one inch between the holes. The partition was then broken out by light charges of black powder.

After this trench had been excavated, it was filled solidly with concrete to a height of 4 feet above the floor of the river. When pouring the concrete, 3-inch pipes were placed vertically in the forms on 5-foot centers, to be used for grouting. After the concrete had set, four Bravo-300 gasoline engine-driven diamond core drills were used to drill holes through these pipes to a depth of 50 feet, with an occasional hole continued to 100 feet. A Ransome one-half yard grouting machine, operating at 90 pounds air pressure, forced cement grout down these drill holes to prevent the possible development of leakage from fissures or seams existing below the river bottom. The value of this operation was shown by one drill hole, which consumed 30 cubic yards of grout; while the work was being done, it was not an infrequent sight to see the grout coming to the surface of the water some 50-feet away from the hole through which it was being pumped.

THE AIR COMPRESSOR PLANT

Two Sullivan WJ-3 angle compound belt-driven air compressors of 870-cubic foot displacement each, operated by two General Electric 150 h.p. motors, furnished air for the operation of all drilling machines, the Ransome grouting machine and other general uses of compressed air on the work. A Sullivan WK-314 220-cubic foot portable compressor was used for similar work outside the range of the main distributing air lines.

TAIL RACE EXCAVATION

Due to the necessity of exercising caution in the excavation of the tail race for the power house, for fear of shattering the walls, and to safeguard against possible leaks, T-3 drills were used to channel out this excavation in much the same way as the cut-off trench. The power house end of the tail race is in the shape of a horseshoe curve. It was thus necessary to use tripods for this work, as the 10-foot quarry bars would not permit drilling on the curve. A Sullivan concrete breaker was also used on this work for cleaning and excavating certain sections not easily reached by the tripod machines.

ACKNOWLEDGMENT

The writer is indebted to Newton D. Rich, Vice President; O. R. Waldum, General Superintendent and Arnold George, Engineer of the L. E. Myers Co., for the information and courtesies extended by them during the preparation of this article.

Representative Specifications for Different Uses of Sand and Gravel

IN its Bulletin 3, the National Sand and Gravel Association, Inc., Munsey Building, Washington, D. C., presents a well-prepared discussion of specifications for concrete sand of the various states and Federal boards, specifications for gravel for concrete, specifications for sand and gravel for bituminous construction and a discussion of the miscellaneous uses of sand in highway construction.

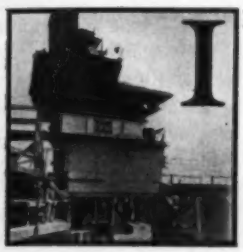
Another section of the Bulletin discusses the use of sand in building construction and the requirements for washed gravel ballast. The tables in this bulletin will be found very helpful by contractors considering bidding in different states as the complete specifications for sand and gravel are tabulated with the date of the latest specifications given.

Copies of this Bulletin may be secured without cost by readers of CONTRACTORS AND ENGINEERS MONTHLY by writing direct to the National Sand and Gravel Association and mentioning this magazine.

Commercial Central Mixing Plants for the Manufacture, Delivery and Sale of Ready Mixed Concrete

By Norman Beggs

Structural and Technical Bureau, Portland Cement Association



IN the last few years new central mixing plants for the manufacture and sale of ready mixed concrete have been established in all parts of the country. In 1925 there were about 25 existing plants. If a similar list were to be compiled today it would contain the names of nearly 100 concerns actually making and selling ready mixed concrete. This shows the recent growth of the industry, is an indication that this class of concrete is being favorably received in many localities, and is a promise for the future. Although certain imperfections still remain in the manufacture and delivery of ready mixed concrete, the development that follows will tend to remove these difficulties and approach the ideal method of producing high quality concrete.

Selection of Site for New Plant

The first consideration in establishing a central mixing plant is the selection of a suitable location. It should be chosen keeping in mind these three main points: *first,* proximity to the supply, and transportation for bringing in concreting materials, *second,* probable market for ready mixed concrete, and *third,* nature and volume of vehicular traffic. The ground area should be of sufficient size to accommodate the mixing plant and to store a large quantity of materials. A well designed layout will eliminate the chance of a shut-down at a time when continuous operations are necessary.

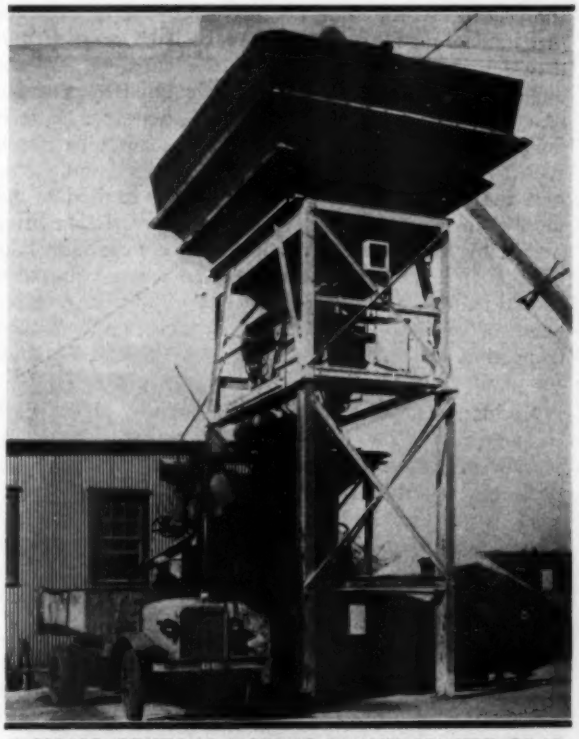
Often a material dealer goes into the business of making and selling ready-mixed concrete. He usually selects a part of the existing material yard as the plant site. This arrangement approaches the ideal, because it combines a supply of aggregates at all times with an established and going business and utilizes ground which ordinarily would be idle or, at least, not put to its maximum utility. A plant built either at the material yard or adjacent to it has an economic advantage as well as the assurance of a constant supply of aggregates. The superiority of a water front site should not be overlooked where economy afforded by using barges for bringing in materials is a factor.

Each plant layout presents an individual problem, the physical characteristics of the property determining to a large extent the general design. Provisions should be made for changes and expansion, so that later improvements may be made with a minimum of expense due to alterations.

Capacity of the Plant

Although difficult to determine, the probable demands on a new central mixing plant should be carefully estimated before construction plans are approved. For quantities up to 150 cubic yards of concrete per day, a 1-yard mixer will ordinarily take care of the work. Should a daily production of 250 to 300 cubic yards be desired, a mixer of 1½ yard capacity is advisable. Where plants are designed to handle up to 800 cubic yards of concrete a day, a 3-yard mixer should be used. With greater capacities it probably will be found desirable to install two 3-yard mixers and operate both of them rather than to plan on a single mixer of a larger size.

Most plant owners agree that the capacity of the mixer and the capacity of the truck for hauling should be the same. If a difference must exist, the mixer should



A SMALL CENTRAL MIXING PLANT OF THE GRAVITY TYPE OPERATED BY THE LAND CONSTRUCTION COMPANY, ST. JOSEPH, MO.

The equipment includes large overhead bins filled by means of a stiffleg derrick equipped with a clamshell bucket. The weighing batchers and water measuring tanks are plainly shown

THE WAREHOUSE IN THE BACKGROUND WAS BUILT ENTIRELY OF READY MIXED CONCRETE

A second unit, similar to the first, is shown under construction with ready mixed concrete again utilized. All operations are mechanical, carrying the concrete direct from truck to forms

be one-half or one-third the truck rating. Under those conditions a batch will be one-third, one-half, or a complete load, the latter being the most favorable arrangement. A minimum amount of time is needed for loading a truck when a single charging of the mixer makes an entire load of concrete. The batch may be started as the empty truck, returning from a job, approaches the plant. By the time the driver checks in, receives instructions for his next trip, has the truck washed, and drives to the loading position, the concrete is thoroughly mixed. His truck is entirely filled by a single batch and he starts for the job immediately. There is no waiting for the second part of the load to be mixed such as is necessary if the mixer capacity is only one-half that of the truck. Most trucks are limited to not more than three yards of concrete, this restriction being placed by a city ordinance providing a maximum load on the streets. The balance of the plant equipment should be designed to prevent tie-ups and delays on account of lack of materials. Any of the large machinery companies will furnish estimates and suggested layouts for plant design.

Building facilities, besides the mixing plant itself, should provide for a plant office, a warehouse for the storage of cement, a garage and a machine shop. It is desirable also to have space set aside for laboratory work where aggregates can be tested and concrete cylinders made and stored. Arrangements for the actual breaking of test cylinders can usually be made with some local laboratory equipped with a suitable testing machine.

CONSTRUCTION OF PLANT

The gravity type of central mixing plant is the most common form of construction. It is built with overhead storage bins for materials which discharge by gravity in weight batches, that in turn empty into the charging hopper of the mixer. The mixer, sufficiently elevated, dumps directly into the trucks. Most of the plants in existence are designed according to these principles, but there may be certain variations in this plan. For example, one large plant visited proportions material by weight at one location, hauls these dry batches in flat bottom trucks a few hundred feet, and dumps them directly into the mixer hopper. Sacked cement is used and is added at the time the dry batches are dumped. Another plant carries weighed amounts of sand, gravel and cement in a bucket conveyor, discharging them directly into the mixer. The purpose of this arrangement is to save head room because the equipment is installed in an existing building.

Aggregates are usually elevated to the bins either by belt or bucket conveyors. Sometimes a stiffleg derrick or crane equipped with a clamshell bucket is used for this purpose. Advantage is always taken of any natural rise in the ground which may assist in the elevation of materials.

If bulk cement is used special handling equipment is required. Mixing water is piped from the city supply to a measuring device where the quantity may be accurately controlled. Electric power has been found extremely satisfactory and quite economical for running the mixer and all other possible equipment. Cranes which travel under their own power are usually operated by steam.

LAYOUT OF PLANT

A structural framework, preferably enclosed to protect the operators and equipment, supports the plant machinery at different elevations. The ground level is devoted to a driveway running either under or alongside the mixer. On the first floor above grade are the mixer and motor. Above this is the charging or operating floor where the plant operator controls the proportioning of the materials and operates the entire plant. Over this are the storage bins. The total height of the plant varies, ranging between 40 and 60 feet.

Paved driveways speed operations at the plant and are almost a necessity. Heavy trucks soon cut through cinders or other similar surfacing material.

PROVISIONS FOR COLD WEATHER

Winter building has become so prevalent in the last few years that the central mixing plant should figure on a fair volume of business during the cold months. Owners of central plants have rapidly come to realize the value of delivering high quality concrete to the buyer, and that in cold weather the quality is seriously affected if heating precautions are not taken. Temperature affects the rate at which concrete hardens, the lower temperatures reducing the rate until it practically stops at the freezing point. Alternate freezing and thawing will completely destroy concrete, while a single freezing may impair the strength and durability. Because of these facts special precautions are required for cold weather work and should be employed whenever it is expected that the temperature will fall as low as 50 degrees Fahrenheit. By supplying live steam to the aggregates through a perforated grillage of pipes lining the storage bins, and using hot mixing water, warm concrete can be produced and delivered to any job serviced. In transit, open trucks should be covered with a tarpaulin to protect the concrete from the weather and to help conserve the heat. Even during the most severe weather only a small amount of heat is lost by radiation from the truck.

Common or rock salt or other admixtures should not be added to concrete to prevent freezing. When chemi-

cals are used in quantities sufficient to lower the freezing point of water to any extent, they reduce the strength materially.

BULK CEMENT

The question of the use of bulk cement is one which often arises at the time of construction of the plant. A number of plants have found it more economical than sacked cement. If protected from strong drafts there is a surprisingly small amount of dust created in handling bulk cement. The savings may be summarized as follows: 1. No labor required for cleaning, handling and shipping empty cement sacks; 2. No lost or damaged sacks; 3. Less labor and quicker unloading of cars, sometimes eliminating demurrage; 4. Less money required to pay for a carload of cement; 5. No bookkeeping for sacks; 6. No fire insurance to pay on stored sacks; 7. No storage space to provide for "empties."

One of the common methods of handling bulk cement is by use of an air conveying system, partly "hydraulic" and partly mechanical in action. It is essentially a tube containing a small screw conveyor fed at the front end by a hopper into which cement from the car is emptied, and equipped at the lower end with an aerated ring through which compressed air enters. Here is attached the conveying pipe, 2 to 6 inches in diameter, depending upon the required capacity. The screw, driven by a small motor, is directly connected to the shaft while the air is controlled by a separate compressor and valves. It is claimed by the manufacturers that the cement is "fluffed up" by the air, held in suspension, and forced through the pipe to the discharge end. At any rate, the volume of the cement is increased and made lighter by the addition of dry air. In this condition it assumes the properties of a fluid and is pushed, not blown, through the conveying pipe by the action of the screw on the incoming cement.

In the storage bin the aerated cement seeks an hydraulic level instead of heaping up under the discharge orifice. From the bin, cement may be drawn into the batcher in any desired quantity by means of a small screw conveyor.

Weight measurement is the only satisfactory method of proportioning loose cement because the volume may change as much as 50 to 100 per cent due to varying amounts of air being included in the mass. Ninety-four pounds is accepted as a standard for one cubic foot of cement. At the mill, cement is sacked on this basis.

TRUCK BODIES

Hauling ready mixed concrete is the biggest problem of the plant owner. This is well illustrated by the fact that, out of approximately 100 central mixing plants now operating, no standard type of truck body is in general use. The smaller plants employ the ordinary flat bottom dump trucks equipped with a vertical endgate or a hopper shaped end to help in dumping. The larger plants, for the most part, operate special trucks of which there are several on the market. Their function in hauling ready mixed concrete is to eliminate any segregation of materials that is apt to occur, to maintain a workable and plastic consistency without necessitating the addition of more mixing water at the job, and to facilitate dumping, making picking and shoveling unnecessary at the time of discharge.

Trucks used for hauling concrete may be classified into three groups:

Flat Bottom Type.—With this type it is difficult to handle concrete having a slump greater than 3 to 4 inches for over a mile or two without causing segregation and compacting.

Special Body Type.—In this group are several designs, all of them planned either partially to eliminate segregation and compacting or to re-mix the concrete during discharge. Here, too, for successful service, the concrete must be of a fairly dry consistency, and thoroughly mixed.

Agitator Type.—There are several types of trucks on the market designed to provide constant agitation in transit. Most of them are capable of handling concrete of any consistency although in some a certain amount of difficulty is encountered in dumping the drier mixes.

Paving concrete, designed with a slump not to exceed 2 inches, can be delivered satisfactorily in almost any truck. When concrete of the consistency ordinarily used in reinforced work, with a slump of about 6 inches, is hauled any appreciable distance it is necessary to use some sort of agitation to prevent the separation of materials. When the agitator type of truck is employed the hauling distance is practically unlimited.

The length of haul, however, becomes an economic factor, for the cost of delivering ready mixed concrete increases with the distance the material has to be transported. Experience will determine the limiting distances, and adjustments in the price of the concrete may be made accordingly.

An Agitator Truck Receiving Its Quota of Fresh Concrete at the Ready Mixed Concrete Corp. Plant in Richmond, Va. Materials Are Handled by a Combination of Buckets and Belt Conveyors

THE J. P. CALLAGHAN READY MIXED CONCRETE PLANT AT HARRISON, N. J., WHICH HAS A CAPACITY OF 600 CUBIC YARDS A DAY

Agitator trucks are used to carry the fresh concrete to the jobs. One such truck may be seen waiting under the plant while another in the foreground hurries off to a job. Bucket elevators, closed and open, carry aggregates and cement to bins in the octagonal loft above the mixer. Sack cement is used, although bulked before use

TESTS ON HAULED CONCRETE

Specifications frequently include a limit between mixing and time of placing concrete. Ordinarily this is 30 to 45 minutes. On rare occasions it is placed at one hour. This limitation is intended to assure a good quality of concrete in the work. Therefore, instead of setting a definite time between mixing and placing of ready mixed concrete, the stress should be laid on the quality. Specifications should state that all concrete should be thoroughly mixed when delivered to the job and be in a plastic and workable condition without segregation. A time limit on the placing of concrete mixed at the site is not often a restriction, but with central mixing plants it may prove a serious hardship, especially in cities where the loaded trucks must pass through heavy traffic sections. The results of tests as indicated in *Public Roads* for December, 1921, and September, 1928, as well as other references indicate that the quality of concrete is not impaired by hauls up to 25 miles in distance or three hours in duration, provided that the material is delivered in a workable condition and will not need additional water to facilitate its handling.

WASHING OF TRUCKS

Truck bodies should be washed after the delivery of each load. When the inside of the truck is clean and smooth, concrete will dump easier than if little or no attention is paid to keeping the body in this condition. An ordinary garden hose and city water pressure are usually sufficient for the purpose. Oftentimes in washing truck bodies, cement and fine material are carried into the drains where they harden and clog the sewers. To avoid this, it is desirable to run the wash water through a sand filter. The installation of a box filled with sand 2 or 3 feet deep through which the water from the wash rack can pass before entering the city sewerage system will prevent trouble from this source. It is a comparatively easy matter to keep fresh sand in the filter, while on the other hand it is troublesome and expensive to clean the sewers after cement has hardened in them.

QUALITY OF CONCRETE

The central mixing plant can be better equipped to produce quality concrete than can any other type of concreting plant. All the facilities necessary to handle every operation economically can be provided without feeling that the cost to one particular job is excessive. It should be the aim of the central mixing plant owner to advertise his plant as producing a quality concrete, and as being able to service any size job with a dependable product. The water-cement ratio, as a basis for making concrete of predetermined strength and quality, has been used on many important jobs during the last few years. Its use is continually increasing and more architects, engineers and contractors are requiring it for their work.

The central mixing plant operator should thoroughly understand the principles of making concrete under the water-cement ratio law. This will give him a practical means of making concrete of predetermined quality. It will also give him a foundation on which to discuss with builders the advantages of quality control. In addition, he will have the opportunity of realizing definite savings in the amounts of materials comprising the mix.

The mixing plant operator is given opportunity to use his experience and knowledge of concrete proportioning so he can design economical mixtures of excellent and uniform quality, adding to his reputation and lasting credit.

COOPERATION AND SERVICE

The success of a ready mixed concrete plant is governed largely by its ability to cooperate fully with contractors. It is the problem of the plant owner; *first,* to have a sufficient number of trucks so there will be no serious delays at the plant due to the trucks all being out on the job; and *second,* to furnish concrete to the contractor at the time he wants it, causing him no inconvenience on account of delays in deliveries. It is better to turn down certain contracts and keep the good will of those who are buying ready mixed concrete than to try to service too many jobs in a single day. The establishment of good will between the central mixing plant and the contractor who is using the product is an important feature toward building up business and securing future orders.

PRICES

Many operators find it advantageous to establish a definite schedule of prices for different classes of concrete. An established price, with small discounts for large quantities and prompt payment of invoices, would seem to be the most satisfactory arrangement. A suggested schedule cannot be given because of the varying local markets. A price at the plant in one city for a certain class of concrete might change to twice that amount in another locality.

Hauling costs can be computed on the basis of established zones which each plant must work out for itself. For example, at one plant in a large city charges for transportation include a 5-mile free haul with a 20 cent charge per yard-mile for overhaul. In a medium sized city prices are quoted with a 2-mile free haul and a 25 cent charge per yard-mile for overhaul. In still another city one company operates on a basis of a fixed price at the plant and a 30 cent charge per yard-mile. Another plan used is a definite schedule of prices for concrete at the plant, plus a 75 cent delivery charge for the first yard-mile, 15 cents for the second, and 10 cents

for each additional yard-mile. Where there are rough pavements or many steep grades, delivery zones cannot be based upon distance alone, but must also take into consideration the physical layout of the community. A condition might exist that would make concrete cost more ½-mile from the plant than it would at another site 2 miles away.

CAPITAL REQUIRED

Capital required to start a central mixing plant depends on the type and size of plant and the trucking equipment. Small plants have been built for as little as $20,000 while others have started business on $40,000 to $50,000. One equipment company estimates that $100,000 is the necessary capital required to finance construction of a medium-sized plant. A large plant may represent an investment of as much as $450,000 or $500,000. It might be fair to state that transportation equipment for the medium and large-sized plants represents from 50 to 70 per cent of the total cost. This cannot be set down as an invariable rule, but it does indicate the amount required for this division of the business.

COST OF TRUCKS

Due to the wide variety of trucks now used to haul concrete, prices vary from approximately $1,000 for the simplest type of small capacity to $8,000 or $9,000 for the heavier types of special design and greater capacity. One concern has 86 trucks operating while another has 64. Several large plants use about this number to handle their business. Some of the smaller companies have only 4 or 5 of the light weight trucks to take care of their deliveries.

OPERATING PERSONNEL

The number of men required to operate a central mixing plant differs according to the design of the plant. Usually there are a plant superintendent, a mixer man, a plant office man, a helper to load trucks, two or three men for handling cement, one or two laborers, and an operator for the derrick or hoisting equipment. Besides, there are truck drivers, and if the plant owns a number of trucks, one or two garage mechanics. Sometimes a night watchman is employed.

RADIUS OF OPERATION

The average radius of haul is another varying factor in connection with the operation of a central mixing plant. Some owners in the smaller cities find that 3 or 4 miles is the limit for deliveries. Others deliver concrete on an average of 5 to 8 miles. Still others have transported concrete as far as 20 miles. Transportation costs then must be computed for each plant before an economical maximum haul can be established.

SALES

Many companies have special sales organization to secure orders, while others depend upon friendly acquaintance with builders. One plant doing a fair business added a special salesman, and in less than six weeks, increased the average daily output from 200 to nearly 300 cubic yards. With a business as new as that of the central mixing plant, sales efforts should be well worth while both for producing immediate results and for advertising features in the use of ready mixed concrete which will pave the way for future orders.

TRUCK MIXERS

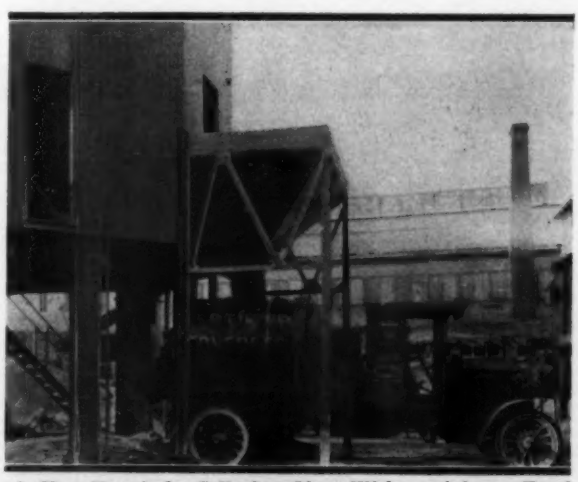
Because of the similarity to central mixing plants, mention should be made of central proportioning plants operating truck mixers. Some ready mixed concrete plants operate truck mixers in connection with their regular business. In general, approval has been placed on the ordinary stationary mixer. Questions have arisen as to whether or not truck mixers efficiently mix the concrete under all conditions of operation. As the driver must operate the truck as well as mix the concrete, the possibilities of accurate control are not as good as at a central plant.

The cost of truck mixers per yard of capacity is greater than trucks used in the ready mixed concrete business. However, with truck mixed concrete the stationary mixer and its maintenance are eliminated. Which method of furnishing mixed concrete will have the greatest development is a matter that only time coupled with future progress in the production of this class of concrete can tell.

CONCLUSION

In conclusion, the points in favor of using ready mixed concrete are: 1. The responsibility for proportioning and mixing all concrete is placed in the hands of one man. This usually results in greater uniformity than is obtained in the field. 2. The permanency of the central plant allows the use of equipment to measure accurately quantities of materials that go into each batch, thus controlling the quality of concrete. 3. Mechanical equipment reduces labor costs to a greater extent than is possible under job methods. 4. The contractor is relieved of the necessity of setting up and maintaining a concreting plant. 5. Storage facilities for aggregates and cement, often difficult to provide in congested districts, are not required. 6. The hauling away of concreting equipment and excess materials after the completion of the job is eliminated.

With a favorable location, good equipment, and careful operation there is every reason to believe that a cen-



A Close-Up of the Callaghan Plant With an Agitator Truck Taking on a Load

tral mixing plant will prove a success. The user of ready mixed concrete is quick to realize its advantages. Where a high quality of product is maintained, a fair price is charged, and an effort is made to give efficient service, there is every indication that the business will continue to grow.

ACKNOWLEDGMENT: From a paper presented before the Thirteenth Annual Convention of the National Sand and Gravel Association.

Method of Submarine Blasting Used in the Miami Ship Channel

By C. J. O'Neill

SUBMARINE blasting or under water shooting, as practiced along the southeast coast of Florida, is commonly known as "dobying." Charges of dynamite are exploded on the surface of the rock body, instead of in drill holes. This method was followed exclusively by the Arundel Corp., the Clark Dredging Co., the United Dredging Co., and U. S. engineers in constructing the Miami ship channel and turning basin, a project of great importance to the shipping interests of the city of Miami. It involved dredging sections of the river bed from 200 to 500 feet in width and to a depth of 27 feet for a distance of five miles.

In those sections which were considered as new additions to the existing channel, this operation meant the removal of as much as 15 to 18 feet of sand and rock, mostly rock. Where it involved deepening the old channel, the average section to be excavated consisted of from 5 to 8 feet of solid rock—a porous limestone formation locally known as coral rock.

At the outset, some of the contractors were under the impression that suction dredges could nose into this rock and remove it without any great difficulty. While this proved true in certain areas, it was soon discovered that by using dynamite to break up the rock in advance of the dredges, the yardage out-put could be doubled.

On first thought it might seem that doby shooting on a job of this kind would be rather expensive, when compared with drilling and blasting in the usual way. It was found however, that when the work was planned carefully and all conditions taken into consideration that doby shooting was the more economical. Among the various considerations which led to the adoption of this method, was the fact that doby shooting reduced to a minimum the number of boulders to be handled. Where suction dredges are employed in rock work, the boulder problem is usually a factor of some importance.

BLASTING IN THE CHANNEL

For a clear understanding of the method of making up the charges and placing them, let us assume that a section of the 200 foot channel is about to receive the attention of the blasters. On the accompanying sketch is shown the position of the dredge working on material previously blasted and to the right, an unbroken rock area to be blasted in four successive shots. The doby charges for the first shot are represented by a series of dots and the blasters will crack that area first.

The first job of the blasters is to prepare the doby charges. From 5 to 10 pounds of 60 per cent Du Pont quarry straight dynamite in 2 x 8-inch cartridges, submarine wrapped, are first made into bundles and tied with binder twine. Then the bundles are fastened to

AERIAL VIEW OF THE HARBOR AND CHANNEL WITH A LARGE SHIP ENTERING THE PORT

a long cord at measured distances of 6 to 8 feet along its length, as shown in the upper section of the sketch. Thus arranged, each line of charges looks like a string of sausages or the tail of an old-time kite.

LOADING CHARGES

Loading the doby charges on the river bed in the position indicated on the working blue-print is not as easy as it sounds. First of all it means finding the exact place to start work, and then dropping the charges with due regard for alignment and correct spacing between the rows.

The dynamite crew, usually a foreman and two helpers, with a rowboat loaded with made-up doby charges, first proceed to establish a location in the channel area from 300 to 500 feet from the place where the shot is to be fired. The anchor is dropped at a measured distance from one of the range lines marking the side of the proposed channel and this place is marked by an improvised buoy. As the long anchor rope is paid out, the boat drifts down to the scene of operation. A small launch or outboard motor boat manoevers the dynamite boat to the position marked "X" in the diagram, whereupon the launch swings to the left and the crew starts work. From 5 or 6 to 8 strings of charges are dropped in parallel lines, with a spacing of 6 to 8 feet between rows. The distance is accurately measured by means of marks or knots made on the anchor rope, which is held taut while the charges are being placed.

Before starting operations, the members of the crew carefully consider the tide, wind, current, depth of water, location and ranges. In areas where the tide and current are negligible factors, the method of placing the charges is quite different from the practice when conditions are reversed. If it becomes difficult to proceed on account of an adverse tide or current, sometimes the charges are secured to a rope or heavy twine extending between two additional anchors placed at the extreme end of the area to be blasted. As the doby charges are dropped, they sink to the floor of the channel, although it is sometimes necessary to weight them with pieces of rock to insure their sinking. Before the last charge is placed, it is usually primed with one or two No. 8 waterproof exploders, to which is attached a leading wire about 250 feet long.

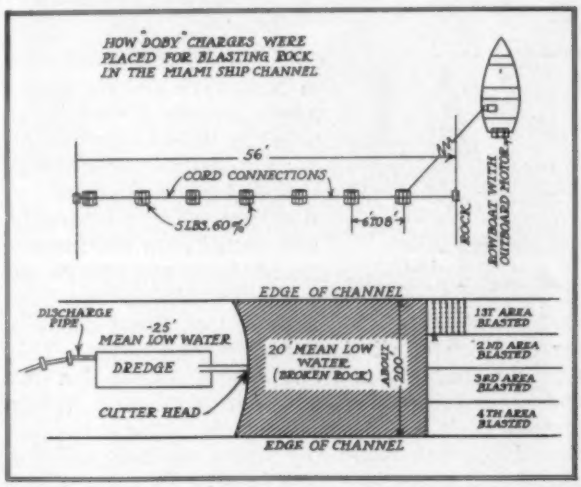
The dynamite crew now moves the boat back toward the buoy by pulling on the new anchor rope, while one member uncoils and pays out the leading wires from the rear end. When the boat has retired far enough away for safety, the wires are attached to a blasting machine, or dry-cell battery and the shot is fired. Shots ranging from 500 to 1,500 pounds of dynamite have thus been set off in a single blast, using one exploder, for in under water shooting the conditions are ideal for propagating the blast.

This plan of shooting in deep sea water has been followed very successfully by Charles DesJardins, who is an expert blaster in this class of work. He supervised almost all the blasting operations in connection with the Miami ship channel project.

EFFECT OF BLAST

It is estimated that a single doby charge of 5 pounds of 60 per cent straight dynamite will blast, in ordinary coral rock, an area of 4 square yards of material to a depth of 4 feet. This is equivalent to approximately 5 cubic yards of rock or one pound of dynamite to the cubic yard. The results, however, depend entirely upon the nature of the rock encountered.

The charges placed in the river channel were governed by the location of the work. For instance, on inside operations near the city proper, charges were limited to a maximum of from 20 to 25 pounds of dynamite, made up in 5 pound doby charges, spaced from 6 to 8 feet apart. Numerous complaints were made by nearby residents against blasting in this vicinity. It was claimed that concussions from blasts were damaging property. Seismograph tests, however, proved that the complaints were not well founded.



SCHEME OF BLASTING OPERATIONS IN THE MIAMI SHIP CHANNEL

The upper sketch shows the layout for a single row of charges and the lower is a plan view of one work area. Note the location marked "X" referred to in the text

DREDGING

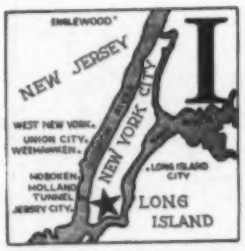
There were three kinds of dredges employed in the work: the ladder dredge type consisting of 43 buckets; the suction dredge equipped with a cover which agitates the rock in front of a suction pipe, and the sea-going hopper dredge which is primarily a suction dredge for sand or soft material. One of this type was used by the U. S. engineers on the outer bar section. At first it was considered impractical for this class of work, but it proved otherwise, for the blasting operations were such that satisfactory results were obtained.

COST AND QUANTITY

The construction of the Miami ship channel and turning basin was one of the big projects completed during 1928. It is reported to have cost $3,000,000. The part played by high explosives may be indicated by the fact that altogether 2,655,000 cubic yards of material were excavated by the use of approximately 2,000,000 pounds of dynamite. The average weight of a total charge was 425 pounds, and the average quantity of dynamite required to remove a cubic yard of material was 1.54 pounds.

Welding Temporary Gas Mains and Sewer Lines

New York Subway Construction Requires Many Shifts in Subsurface Structure Including the Underpinning of Foundations



IN the construction of subways in New York and elsewhere, a great amount of work is entailed in the maintenance of gas, water and sewer lines and electrical wires and cables. Buildings which are already constructed must also be protected from any chance of foundation failure. Pipe lines must be maintained in working condition at all times during construction. This type of work has been a very difficult construction feat and has required much attention in the new Nassau Street Loop in the New York subway, owing to the fact that this branch runs under streets and near building foundations which have been in place for many years. Welding with oxy-acetylene equipment has played an important part in this work, especially in diverting pipe lines, and in underpinning buildings.

Building Pipe Lines

The first series of mains to be diverted were the gas lines. These were taken care of by substituting welded pipes, of sizes ranging from 2 inches to 24 inches in diameter, which run on the surface rather than underground, and which are a familiar sight to New Yorkers and visitors. At intersecting streets the gas lines are carried overhead on by-passes. These are usually of welded construction.

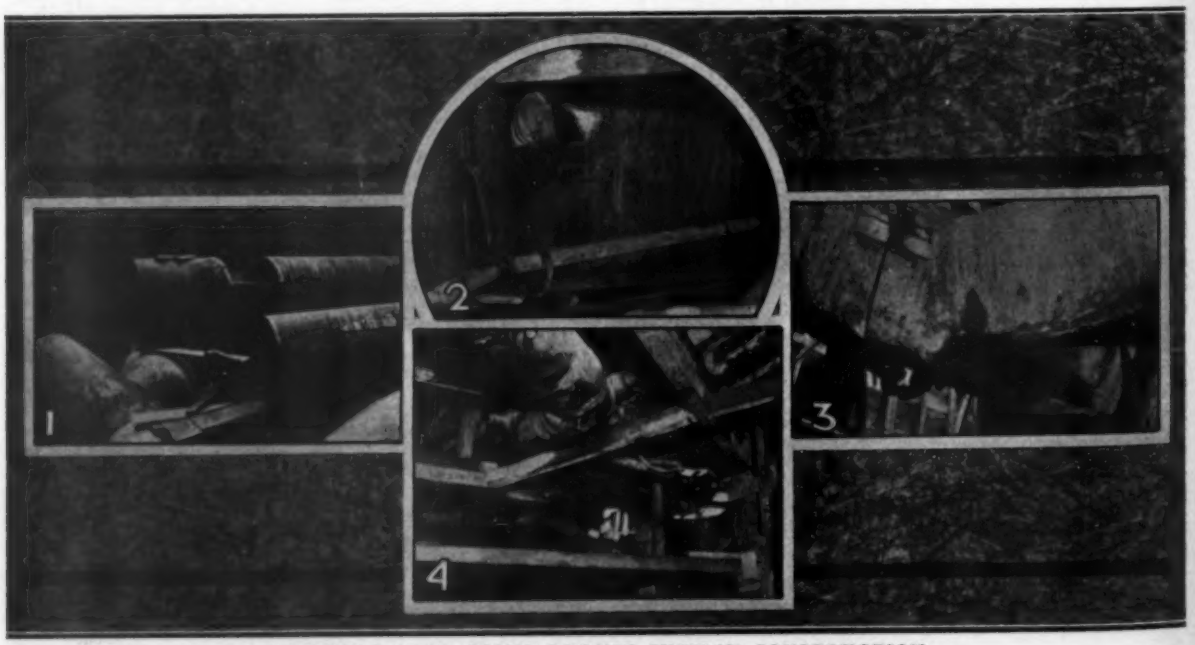
Diverting Water Lines

Water lines are diverted to the sides of the street directly under the temporary planking, which serves as a roof for the open cut. Sewer lines are also handled in this way. These temporary lines are supported by ½-inch wire rope hangers.

Sewer Lines

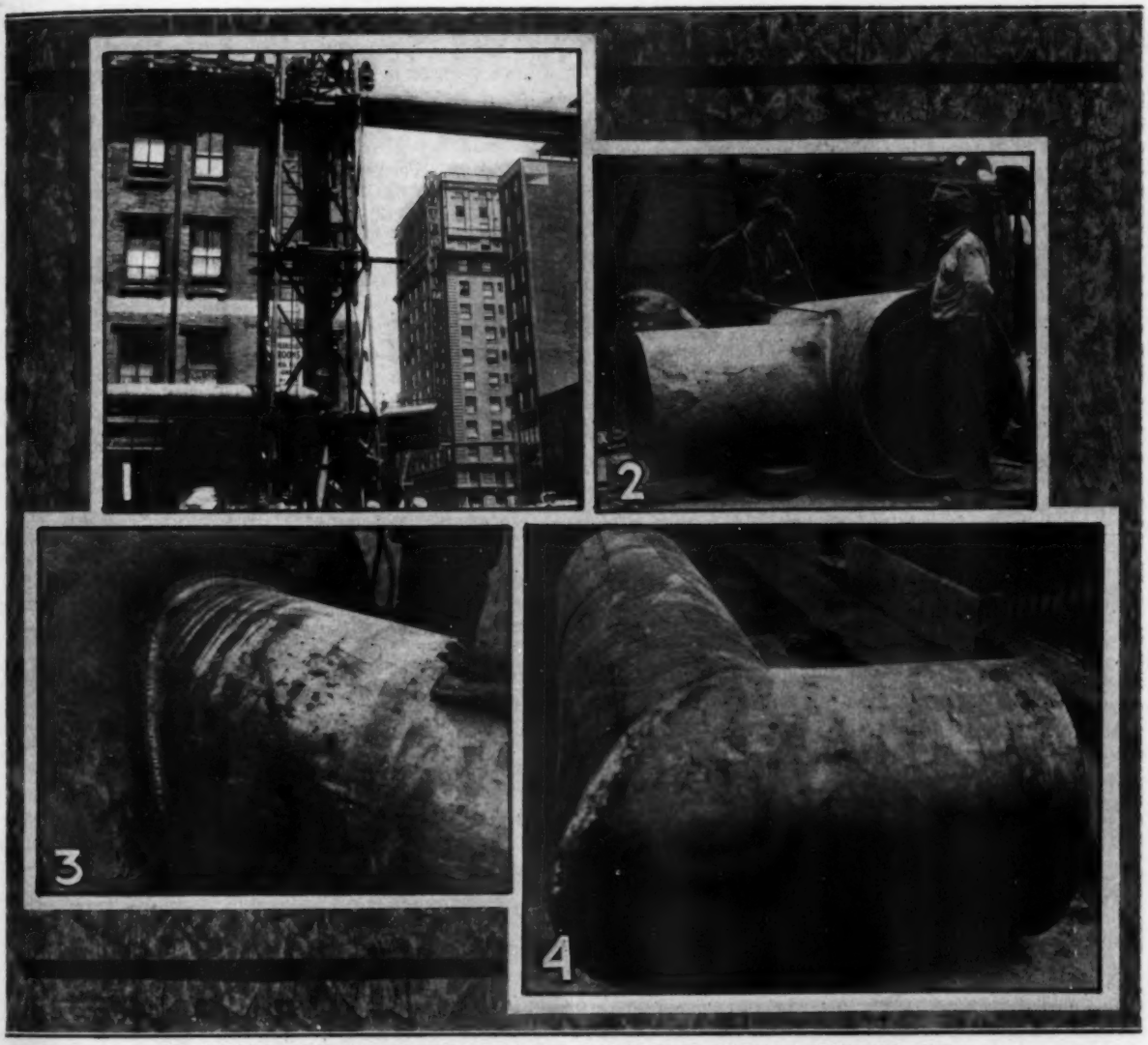
The old 5-foot circular brick sewers ran under the middle of the streets, and these had to be shifted to one side, because the clearance between the top of the subway roof trusses and the street level is not sufficient. The subway tracks are to run through the middle of the arch, as shown in the accompanying diagram, and the sewer pipes are to be carried directly under the sidewalk in the space left above the subway structure. The sewer pipe has been the largest pipe worked on in this construction. Most of it was 42 inches in diameter.

It was found that this temporary installation could



WELDING OPERATIONS DURING SUBWAY CONSTRUCTION

1. A pipe fitted by welding to rest under a 24-inch I-beam. 2. Cutting out steel sheet piling. 3. A welded pipe installed on the subway roof. 4. Lightweight pipe was supported by wire rope hangers



EXAMPLES OF WELDED PIPE IN NEW YORK CITY SUBWAY CONSTRUCTION

1. *A welded overhead gas line bypass.* 2. *Making a 42-inch welded tee.* 3. *Detail of the finished weld.* 4. *A 90-degree welded elbow*

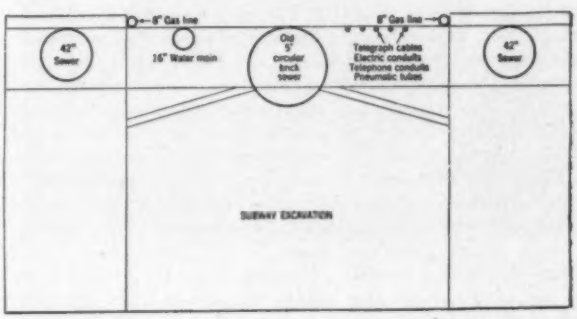
be made most readily by welding, permitting the use of lighter weight pipes, eliminating all heavy special fittings, and allowing the walls of the pipe to be much thinner than would be used in any other system of jointing. Since these pipes run very close to the street and are suspended by hangers made of wire rope and shackles, the feature of light weight was an important one.

Any special fittings necessary were made out-doors, in a yard set aside for this work. One of the illustrations shows the yard with a 90-degree turn at the extreme left, then a tee consisting of a 42-inch pipe and a 30-inch pipe, another 90-degree turn with several short sections of pipe in the foreground. After these were finished they were put into position, with tie-in welds. Very little reinforcement was made on this pipe, since the pressure it carries is not high.

One of the illustrations shows a pipe which had to be cut so that it fitted under a 24-inch I-beam support. A segment of the pipe was cut out and three plates welded in to make this by-pass.

FOUNDATIONS

In installing the sewer pipe under the sidewalk it was necessary in many cases to shore up the neighboring buildings. For this purpose extra heavy pipe was welded and set in concrete, and backed up against the building foundation. The strength of the pipe when



Layout of Water and Sewer Lines During Subway Construction

filled with concrete and set in a concrete base was enough to take care of the weight thrown upon it from the foundation.

The space under the sidewalk which was reserved for sewer and water pipe was not very roomy and sheet piling had to be used in some instances as a retaining wall. After the construction of the subway at these points was completed, the piling was removed and used over again whenever possible. In some instances it was found better to leave this steel sheet piling in place and cut off the top sections below the level of the street.

Drainage for Subway Excavation and Maintenance

AT a meeting of the New York Section, American Society of Civil Engineers, devoted to subway construction, Lazarus White, President, Spencer, White & Prentis, Inc., New York, presented a very interesting discussion of the handling of subsurface water by sumps and by well points. He called attention to the fact that there are three methods of drainage, well points, drainage sumps and ordinary ditching. Each has its own particular use and its use is dependent entirely upon the fineness of the ground.

Ditches are particularly applicable where the ground is fine-grained. If well points are used, the points will not produce enough water to affect the ground. It is important to determine the character of the ground so as not to employ a useless set of well points.

A drainage sump which is, in effect, a large protected well point, is sometimes very effective. On a job handled by Spencer, White & Prentis, on Nassau Street, New York, three kinds of material were encountered. There is an old glacial hill at City Hall which contains rather coarse material. There is another hill of hardpan a few blocks south at Wall Street and between them is a valley filled with fine material. At Maiden Lane, just south of City Hall, neither well points nor drainage sumps would work and it was necessary to use ditches and shallow sumps and that method worked out very well. When fine, wet material is encountered, it is not possible to work rapidly, for if the ground is forced, it boils, and boiling ground is the very worst thing that can happen on any contract. It draws material from places outside the excavation and loosens up the sheeting and bracing, causing settlement outside. Any sign of a boil is a bad symptom. It is a disease which simply must not be permitted to develop.

Well points are being used more and more. Their range of use is increasing as contractors learn more about them. An instance of their use on a large scale is in Brooklyn, where the Arthur A. Johnson Corp., has used them without undue cost. This method must not be discarded but must be used with discretion.

WATERPROOFING VS. CONSTANT PUMPING

In the case of subway construction and the drainage problem there is always the choice from the design standpoint of waterproofing a structure or draining the water permanently and leading it away so that it will not have a head against it. In the New York subway it has been the policy to waterproof and keep out the ground waters. In Philadelphia, they have adopted the opposite policy, by using under-drainage and pumping the water. The same policy applies in buildings. Some engineers prefer to keep the head off the cellars and walls and others prefer to waterproof. Both methods, if intelligently carried out, will work, but, if a drainage system is used, care must be taken that the system will not clog up and that it can be cleaned out in case of clogging. There is little chance of any particular danger to the surrounding ground when this system is used. Pumping down the ground water is one of the things that always happens in cities and must affect all the ground and make excavations for sub-basements just so much easier. It has the effect of causing decay in wooden piles, but that is unavoidable. It has been determined that one pumping down ground water is not legally responsible for decay of neighboring pile foundations.

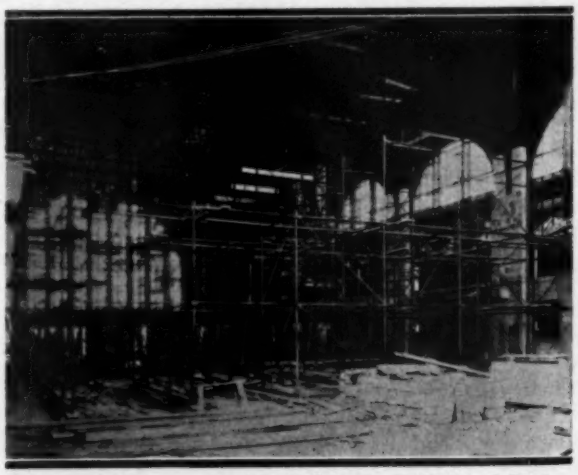
In all excavation work, drainage is by far the most important factor to be considered, and more contractors have suffered serious financial losses and more engineers have suffered damage to their reputations, because of defective drainage than for any other one reason.

Steel Scaffold on Rollers Used in Building Vaulted Roof

THE problem of constructing the great vaulted roof of the New York Central Railroad Station in Buffalo called for careful planning. It was found that a tall and rigid scaffold would be needed to support the tile in the Gustavino arch that forms the ceiling of the passenger concourse. For this purpose a tubular steel scaffold was used by the Walsh Construction Co., of Davenport, Iowa.

The passenger concourse is 66 feet wide and 225 feet long. The crown of the arch rises to a height of 57 feet 6 inches above the floor. The scaffold used in supporting the tile in the arch while work was under way was made up of standard light American Tubular Elevator Co., towers connected by horizontal struts to form a rigid structure, as shown in the illustration. Each tower was 6 feet 4 inches by 8 feet in plan. The towers were erected 8 feet apart in rows spaced 6 feet 4 inches apart. The legs were of heavy 2-inch steel pipe, the girts 1½-inch pipe and the diagonal braces of ¾-inch steel pipe.

As the scaffold was intended to be rolled along the concourse, it was erected on wood rollers for this purpose. Instead of the four channels ordinarily placed under each tower, two continuous sills were used under each row of towers to allow movement on the rollers. To permit the scaffold to be handled in sections, the long sills were divided.



Tubular Steel Towers Used in Buffalo, N. Y. Railroad Station for the Erection of the Arch Roof

The use of the scaffold made erection and dismantling easier, eliminated the fire hazard, admitted more light and provided the strength and rigidity necessary in the construction of the tile roof. One of the towers was rigged as a hoist by adding a cathead and guides. The tower material was leased by the Walsh Construction Co., from the Dravo Equipment Co., Pittsburgh, Pa.

New Type of Steel Building Construction in the Middle West

By Jack Singleton

District Engineer, American Institute of Steel Construction, Inc.

THROUGHOUT the middle west a new type of office building is being erected with great success in various cities. This form of construction incorporates the use of structural steel frame with light scientifically designed floor members, all fireproofed with the latest, most approved methods of insulating materials to satisfy the requirements of the various state inspection bureaus having jurisdiction over insurance rating.

In the past, structural steel was used in the larger cities for buildings of 15 stories or of greater height. Other materials were used for the countless 8, 10 or 12-story buildings, either office, apartment, hotel or hospital structures. These other materials were used primarily because structural steel had not as yet been fabricated in conjunction with materials that would enable it to be utilized on a competitive basis as regards first cost for the smaller type of building.

The old method of fireproofing weighed down a steel frame so that the dead loads were excessive and the amounts of material, other than structural steel, were so great that a steel frame building of the light occupancy type ranging from 8 to 12 stories cost more than a building of other materials as regards initial outlay, although no type of construction proved more economical from a standpoint of maintenance and obsolescence.

Realizing the fact that the steel industry as a whole had done nothing to keep pace with modern construction development, the various fabricators throughout the United States and Canada together with the rolling mills formed in 1921 the American Institute of Steel Construction. This Institute had, among other aims, the desire to bring the use of structural steel into more common use, basing that use on sound engineering principles and practice. It is needless to go into the developments of the steel industry since the inception of the American Institute of Steel Construction. It is only necessary to state that because of the developments by maker and manufacturer of steel products the present types of construction are possible.

The modern type of construction employed permits of very rapid completion of the building and makes possible any desired alteration or changes after the building is completed. A structural steel frame building is the only building that permits of these economical changes and alterations. If for any reason the owner of a building desires to alter his structure to suit some definite plan or wishes to enlarge or change the building to meet changes of economic conditions it is possible to do so easily and cheaply if the building is of steel. If it is necessary to entirely remove the building to provide for a larger structure on account of increases in land values or for any other reason a steel frame building may be dismantled and the steel salvaged at a value sufficient to pay for the demolition and it will still be in condition to reerect at some other site.

Approved by Fire Underwriters

In using the new type of steel construction all details have been presented to the inspection bureaus or underwriters for their approval so that the owner may be assured of basic fireproof rates. No details of construction are permitted that would endanger the structure in any way. The steel frame is entirely self-supporting and when used in conjunction with the new systems of floor construction presents the lightest type of building known that is composed wholly of standard materials of construction. Due to the great saving in weight and because structural steel is capable of carrying loads many times per square inch heavier than can any other material, a great saving in floor space due to sizes of columns is realized. It is also possible to cut down the story heights since structural steel

The New Home of the Salt Lake Building and Loan Association, Hutchinson, Kansas, Which Is Typical of the Steel Frame Buildings of Abbreviated Height Now Being Economically Constructed Throughout the Middle West

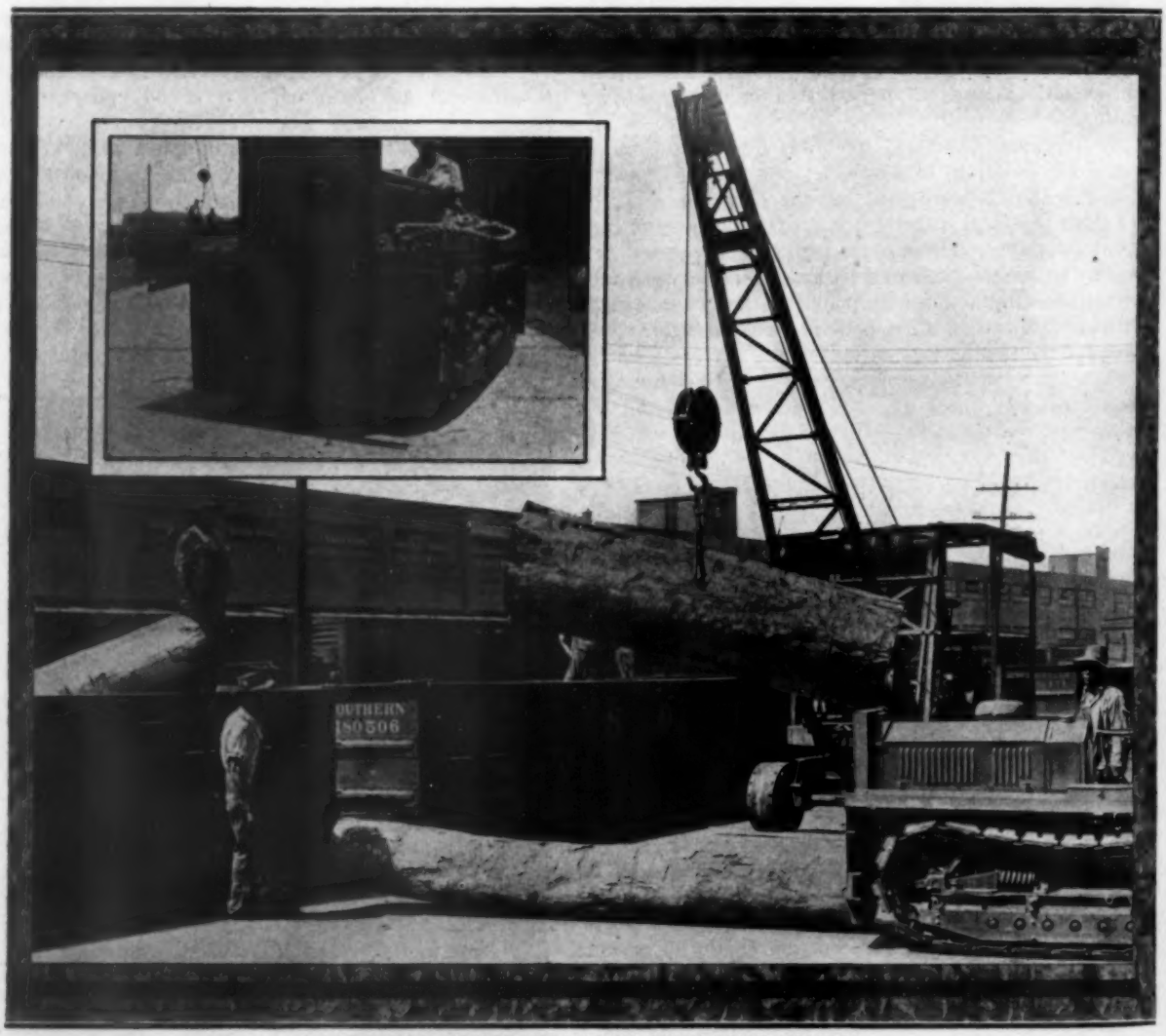
beams may nearly always be used of considerably less depth than if the building were built of other materials.

A steel building is the last word from an engineering standpoint as regards its ability to withstand stresses from high winds, tornadoes, etc., and permits ability to undergo earthquake shocks without signs of distress or failure. Since the earthquake in San Francisco, San Bernadino and Tokio nearly all large buildings in these cities are being built of steel due to the fact that structural steel buildings that were in existence during the quakes were almost, without exception, the only buildings that came through without harm.

A new 10-story hotel is being completed in Tulsa, Oklahoma, built according to the latest series of engineering, incorporating the use of steel frame with rolled steel beam floor members, the entire structure being fireproofed with pre-cast gypsum blocks. Gypsum has long been known as one of the greatest insulating materials for use in fire protection. Without question there will be other materials for fire-proofing developed in the very near future that will be equally as satisfactory.

Buildings of this new type of construction are also being built in Kansas City, Wichita, Salina and Hutchinson, in fact, they are coming into general use throughout the middle west.

All details of construction, allowable stresses in various materials, etc., are all approved by the American Institute of Steel Construction, the Bureau of Standards at Washington and other national bodies, and will satisfactorily pass the requirements of local city building departments.



A HINT FOR CONTRACTORS IN HANDLING TIMBER

The stories of elephants handling timber in India are still cause for wide amazement. Captain T. E. Walker, Pier Superintendent, United Fruit Company, New Orleans, La., has an armor clad Model 20 Cletrac with rubber treads, which he uses for all kinds of dock jobs such as moving mahogany logs around, switching cars, etc. The buffers were put on fore and aft by the C. T. Patterson Co., Cletrac distributors in New Orleans, without boring a hole in the tractor frame. A few bolts were lengthened and that was all. The rubber treads act as squeegees on the wet dock pavement drying the surface and creating firm traction immediately. With the Cletrac is shown its side partner, an Orton portable crane

Dirt Handling at the 39th Street, Chicago, Sludge Disposal Plant

$35,000,000 Construction Project Under Way Involves Removal of 500,000 Yards of Earth at Sludge Bed Site

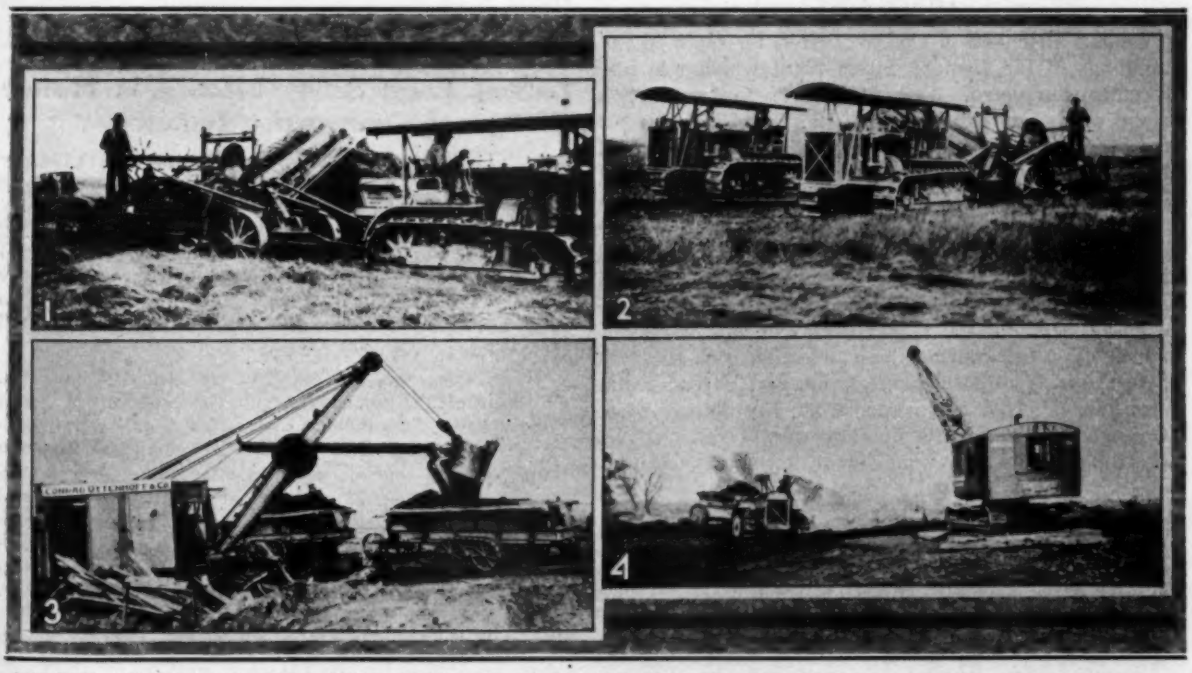
A VERY interesting piece of work from the construction standpoint is involved in the handling of earth excavation for the sewage sludge disposal plant of the Sanitary District of Chicago at 39th Street and Cicero Avenue. In the neighborhood of $35,000,000 is being spent on the construction of this plant, making it the largest in the world, and only the most modern and up-to-date construction and engineering practice is being employed.

At the present time a contract for 500,000 cubic yards of dirt removal is going ahead. Division O construction work on this project was let about the second week of September, 1928, to the Warner Construction Co., of Chicago, which, in turn, sublet the 500,000 cubic yard excavation to Conrad Ottenhoff & Co., 1220 South Leavitt Street, Chicago. The greater portion of this excavation consists of building the sludge beds. Nothing but a solid clay material is used for the bottoms and sides of these beds, which has necessitated the stripping and removing of a very considerable quantity of black dirt overlying the clay.

The Conrad Ottenhoff Co., sublet this stripping work, which was ideal elevating grader work, to H. H. Embody & Son, of Aurora, Ill., who are using three elevating graders, loading both the latest type large capacity crawler dump wagons, as well as 1½-yard dump wagons with three-up hitches.

Upon receiving this contract from the Warner Construction Co., Mr. Ottenhoff, who is known for his ability to handle large jobs and push them through to completion in record time, immediately laid his plans so that the greater portion of the work would be completed by December 1, 1928. As has already been mentioned, the elevating grader work was sublet to Embody & Son, who started operations about the last week of September, and have been removing about 4,000 yards of dirt per day when ground conditions would permit.

Ottenhoff & Co., placed two 1-yard gasoline shovels and also a 1-yard dragline in operation, the whole equipment consisting of eight 7-yard crawler dump wagons pulled two each in tandem by 10-ton tractors.



STREET AND EXCAVATING OPERATIONS OF THE 39TH STREET AND CICERO AVENUE SEWAGE TREATMENT PLANT, CHICAGO SANITARY DISTRICT

1. An Austin elevating grader stripping black top soil from the sludge bed site and delivering the dirt to tractor-drawn 7-yard dump wagons. 2. Another view of the stripping operation. 3 A Lorain 1-yard shovel loading heavy clay into a tandem of crawler wagons. 4. A Northwest 1-yard dragline working in the heavy clay

This portion of the work necessitated the excavating of some sections of the old Ogden ditch and the filling in of others. Under good hauling conditions, a single 10-ton tractor has handled two 7-yard crawler wagons without a bit of trouble, or, when wet weather and soft hauling conditions were encountered, a single wagon has been hauled by one tractor.

After the black dirt was removed, solid clay was excavated and dumped in position to form the bottoms and rolled sides of the sludge beds. Ideal hauling and excavating conditions during a good share of the time have resulted in a total output of 7,000 cubic yards per day with all equipment in operation.

SIZE OF PROJECT

The sludge beds under construction are designed to take care of all the solid sewage matter or sludge pumped down from the Howard Street plant of the Sanitary District, which is located at the north limits of Chicago. An idea of this stupendous sanitary system may be had when one realizes that this sludge is pumped about 15 miles from the Howard Street plant into this new plant now under construction at 39th Street and Cicero Avenue.

OTHER WORK

Conrad Ottenhoff & Co., excavated for most of the buildings of the Howard Street plant which was just recently completed. One portion of the excavation alone consists in the digging of pits 300 feet long, 200 feet wide and 52 feet deep for the pumping station. All the landscaping was also done by the Ottenhoff Co. Mr. Ottenhoff has had over thirty years of excavating experience, and among his many jobs in Chicago has been the excavation for the Soldiers Field Stadium and for the famous Tribune Tower. He has recently completed a very considerable amount of excavation work for the T. J. Forschner Contracting Co., which has other contracts in connection with the 39th Street sewage disposal plant, while Mr. Ottenhoff has also just received a contract from Dowdle Bros., of Chicago, which consists of excavating for docks and dredging the Sanitary Canal for boat entrances.

Landslide Interrupts Shady Side-Dilles Bottom Job

SINCE the description of some of the difficulties encountered in hewing out a road along the Ohio River between Shadyside and Dilles Bottom, in Belmont County, Ohio, which appeared in the February issue of CONTRACTORS AND ENGINEERS MONTHLY, it may be of interest to report the occurrence of a landslide of considerable extent on December 27, 1928. This slide is the outgrowth of an old landslide which first occurred in 1907. During every Spring thaw and even after a sustained rainfall hundreds of tons of earth and rocks have slid down on the Pennsylvania Railroad's tracks which parallel the new highway. This old slide was about 300 feet wide and 650 feet long, comprised about four acres, and lay between Stations 154 and 157 of the new highway. When plans were drafted for this road about $20,000 was set aside to care for this slide.

The new slide developed at Station 160 + 50 and deposited about 100 cubic yards of earth on the railroad tracks. This slide, which is about 100 feet wide and 200 feet long, comprises approximately two acres and was caused by seepage from springs above the proposed highway. In order to stop this slip it will probably be necessary to use cribbing or piling on both the upper and lower sides of the roadway. An additional $10,000 will be required to take care of this new slip.

A Partial View of the Slide Before It Reached Its Present Development

Dr. G. E. Ladd, Associate Economic Geologist, U. S. Bureau of Public Roads, and Professor F. H. Eno, Research Professor of Highway Engineering, Ohio State University, are studying this slide. Their report on the slide as to measures to be taken to remedy it is being awaited with interest. This slide is typical of one of the problems encountered in constructing roads in southeastern Ohio and western West Virginia.

Largest Local Safety Meeting in History of Construction Industry

ATTENDED by the largest gathering of men in the contracting branch of the construction industry for the consideration of reducing casualties and insurance costs, the safety dinner meeting held at the clubrooms of the Building Trades Employers' Association on February 4 proved to be one of the most important steps yet taken by the Accident Prevention Committee of the Association to bring home to contractors the value of safe practices and the keeping of complete records.

The meeting was presided over by Henry W. Lohman, Chairman of the committee, and Vice-President of James Stewart & Co., Inc., builders of the New York Central building in New York City and other well-known structures throughout the country, and was attended by general contractors, sub-contractors and superintendents, safety men and officials of prominent liability insurance companies. The principal speakers were D. H. Dixon, Vice-President, Turner Construction Co., who is considered the dean of construction safety men in this country; Frank B. Rogers, Vice-President, W. P. Chrysler Construction Corp.; Max Baumann, President, The Geo. S. Holmes Co., Inc.; J. E. Rutzler, President, E. Rutzler Co., and Samuel B. Donnelly, Chairman of the Board of Control, Allied Metal Industries. Otto H. Taub, Secretary, John Lowry, Inc., read a paper prepared by Mr. Lowry. These men with Mr. Lohman make up the Accident Prevention Committee.

The speeches urged the advantage of keeping accurate and detailed data on accidents, of the organization of a safety committee by the builder on each job and cooperation of the general contractor with the committee, and of creating interest in safety work among the contractors, foremen and workmen themselves.

W. H. Cameron, general manager of the National Safety Council, Chicago, was among the guests and gave a brief talk in which he congratulated the committee on its work in the past year and offered the entire resources of the Council to aid in the work.

Equipment for Sub-Aqueous Foundation Work and Tunneling

COMPRESSED air to aid in the construction of deep foundations in water or water-bearing soil was first used by Smeaton in 1778 although it is recorded that the Greeks were aware of the uses of diving bells as early as the beginning of the 16th century. The compressed air caisson, as we know it, was first employed by M. Triger, in England, about 1840, while one of the first bridges founded on piers built by the pneumatic caisson method in the United States was constructed in Omaha in 1869. This was closely followed by the Eads bridge, built at St. Louis in 1872. Since that time the pneumatic caisson process has come into general use. After the development of the sinking of vertical pneumatic caissons, it was a natural step during the year 1879 to apply the same methods of using compressed air to the construction of tunnels under water and through water-bearing soil.

It being necessary to keep the air pressure constant in the working chamber or heading, and at the same time to provide a means of admitting both men, tools, concrete, etc., as well as to pass out to atmospheric pressure the excavated material, the airlock plays a very important part on all pneumatic work.

Contractors and engineers soon realized that the early methods of building airlocks in the caissons, shafting or tubes, in many instances below high-water level, was very dangerous and inefficient. Present up-to-date methods call for an airlock well above possible high water and attached to the top of the caisson tubes or shaftings. It is necessary for the airlock to be as economical as possible in the amount of air used for "locking" both in and out and also to require the least possible time for decompressing, equalizing and for the opening and closing of doors.

Airlocks can be divided into two distinct types—vertical, for use in sinking caissons, etc., and horizontal for tunnel work. These types can again be roughly subdivided into four classes —man, material or excavating, concreting or combinations of all three, and medical or hospital locks.

Vertical man locks are very often used when a large caisson is to be sunk; horizontal man or emergency locks as a rule must always be used on pneumatic tunnel work. As the name implies, both vertical and horizontal material or excavating locks are used to pass out the excavated material from the working chambers or headings and bring tools and supplies into the chambers or headings. The vertical locks employ buckets, and the horizontal locks use cars.

It is only on bridge and building caisson jobs that a special lock is employed for concreting. This is due to the fact that employment of buckets to lower the concrete is too slow and requires a man at the bottom of the shaft or working chamber to dump the buckets. With the concrete lock, which is usually an attachment to the excavating or material lock, as much as a yard of concrete can be handled at one time. One type of concrete attachment can be operated entirely from the outside, while another type requires a man on the inside of the lock to operate the door of the attachment.

At the present time, about 75 per cent of the states have air or caisson laws regulating the equipment to be used, hours of work, care of men, etc., on all work requiring men to work under compressed air. These laws require a medical or hospital lock for treating "caisson disease" or the "bends."

Caisson shafting or tubing is either plain, ladder-type, or ladder pocket type; the ladder type has steel ladders, bolted to the inside of the shell for the use of men. This type is employed when buckets being used are small enough to clear the ladder without danger of catching. It is also used in connection with man locks, in which case buckets do not pass up and down. The ladder-pocket type is so made that practically the full diameter of the shafting can be used for the buckets, as the inside of the shell is flush.

We are indebted to W. G. Schalscha, Secretary, Union Iron Works, Hoboken, N. J., for this material.

ONE OF SEVERAL BRIDGE PIER CAISSONS CONSTRUCTED BY THE WHITING-TURNER CONSTRUCTION COMPANY, OF BALTIMORE, MD., AT LOUDON, TENN.

This photograph shows two Union sliding door airlocks of the large river type in which caisson buckets of 17 cubic feet capacity are operated. There is also shown a standard 54-inch diameter Union man lock. In addition to the equipment shown in the photograph, there is also being used on this job a 1-cubic-yard capacity Union concrete attachment, a 6-foot diameter by 18-foot, 9-inch Union medical lock and about 500 lineal feet of 36-inch Union ladder pocket shafting

Who's Who in Construction

A Series of Reports from Active Contractors Published Monthly

Index for Who's Who in Construction, January, 1928, to Date

Beginning in the January, 1928, issue of CONTRACTORS AND ENGINEERS MONTHLY there has appeared each month a department Who's Who in Construction which contained brief descriptions of contracting and engineering firms throughout the country. These articles gave a short history of each firm, the main office and its branches, the officers and its recent major contracts. The following is a list of the companies which have appeared in this department, the numbers on the right indicating the month and year in which they were published.

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Hand Floating a Transverse Joint from a Bridge Across the Concrete Pavement Slab

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Trucker Was Not an Employee

Johnson was employed by a bridge construction company to haul steel girders, etc., to the site of a job. In doing the work a piece fell on his hand and he sought to hold the company liable under the Louisiana employers' liability act. But, in the case of Johnson vs. Vincennes Bridge Co., 118 So. 820, decided October 29, 1928, the Louisiana Supreme Court held that the trial judge properly ordered the proceedings dismissed, on the ground that Johnson was his own employee and not that of the company. The following extract from the opinion of the Supreme Court will serve to show, as a general proposition, circumstances under which one may be deemed to be an independent contractor, and not an employee of a contractor who has engaged his services:

"Plainly, the transaction was not one in which the respondent [the bridge company] exercised, or was intended to exercise, any supervision or control over the relator [Johnson]. The latter was not required to unload particular pieces of steel as they were pointed out to him by the respondent or its agents, nor was he specifically directed to the place where and to whom he should deliver the steel. Relator was not carried on the pay roll of the respondent, nor was he to be paid bi-weekly on the regular pay days. Under the agreement, all that was required of the relator was that in his own time and in his own way he should unload a specific amount of steel from a particular railroad car and transport it from that point to a specific destination—the bridge site—for a stipulated price per ton. Relator furnished his own truck, and employed his own laborers, who were unknown to the respondent, in order to carry out his part of the agreement. He expected to complete the work in four days, at a total expense of $37.50, including a charge of $5 for the use of his truck, netting him $27.50 as his profit on the contract. The fact that relator, in unloading the steel from the car, was permitted to use some equipment belonging to the respondent, does not destroy his character as an independent contractor. . . . Nor was that result accomplished because, the morning after relator was injured, respondent secured other persons to complete the unloading and hauling of the steel. Respondent himself sent his own truck and employees to continue the work, but, when they found that other persons were on the job, these employees returned with the truck to the home of the relator. The nature of the contract was established by the terms of the agreement, and neither of the parties could control its legal effect. Relator could have insisted on his rights under the contract, and, if respondent's action in cancelling it was unwarranted, could have sued for and recovered the profits of which he had been deprived."

Contract of Unlicensed Corporation Held Void

Because a corporation to which the city of Excelsior Springs, Mo., let a paving contract was not licensed to do business in Missouri—being a non-resident corporation—the Supreme Court of the state decided that the contract, and all proceedings under it were void. (Flinn vs. Gillen, 10 S. W. (2d), 923, disposed of November 16, 1928.) The fact that such a corporation may have been the lowest bidder makes no legal difference, the court holds.

Contractor Had No Valid Claim for Being Delayed

A contract for state work contained a provision to the effect that the contractor should make no charge for delays or hindrances from any cause during progress of the work, but that, if there should be any delay caused by the state authorities or by other contractors, an extension of time for performance would be allowed if immediately demanded in writing.

In the case of F. N. Lewis Co., Inc., vs. State, 230 N. Y. Supp. 517, decided by the Court of Claims of New York August 22, 1928, it was held that this provision debarred the contractor from claiming damages for being delayed in performing his work, through delay of the general contractor in having the site ready. But the Court of Claims seems to have treated it as being a material circumstance that the delay did not prevent the contractor completing the job within the time fixed in the contract.

Rights of Highway Subcontractors Considered

That a subcontractor on a highway job was delayed through the state engineer's tardiness in setting stakes gave the subcontractor no claim against the general contractor, held the Washington Supreme Court in the case of Rachow vs. Philbrick & Nicholson, 268 Pac. 876, decided June 25, 1928.

It was further decided that since the subcontract, which was for grading, referred to the general contract, the subcontractor was bound by a provision in the general contract requiring the grading to be done in such way as to avoid interference with a bridge contractor.

One point was decided in favor of the subcontractor, and that was that since the subcontract provided that the general contractor should give the subcontractor at least three days' notice in writing of intention to complete the work on the subcontractor failing in default in performance, and of intention to deduct the cost from what was due the subcontractor, the general contractor could not hold the subcontractor liable for any increased cost in completing the job on the subcontractor becoming in default unless the required notice was given. The court said that "a provision such as this is placed in a contract for a well-recognized purpose, and, the written notice not having been given, there can be no recovery upon the cross-complaint" of the general contractor. The fact that the subcontractor had been "orally urged to complete his work" was not a substitute for the written notice required by the contract.

Highway Contractor Is Liable for Injury to Adjacent Property Caused by Negligent Blasting

In the case of Schamahorn vs. Gehlhausen, 163 N. E., 289, decided by the Indiana Appellate Court October 25, 1928, judgment against highway contractors for injury to adjacent property, caused by blasting, was affirmed. The court remarked:

"The fact that appellants [the contractors] were acting under a contract with the highway commission in building the highway past appellee's house did not relieve them of the responsibility of using due care not to injure appellee's property in carrying out the contract, and, failing so to do, they must respond in damages for any injuries resulting from their negligence."

Owner May Waive Written Order for Extras

Common sense, not legal absurdity, has compelled adoption of the rule that, although the parties to a construction contract may have solemnly agreed in it that the contractor shall not be allowed extra pay for additional work, etc., unless such work be authorized in *writing*, still the contractor can recover extra pay by proving an *oral* agreement for it. As will be seen in an extract quoted below from a New Jersey decision, the theory of the law on this subject is that the original contract was not required by law to be in writing and therefore there is no good reason why it should not be modified by subsequent oral agreement.

But it is dangerous for contractors to rely upon oral agreements for extras under such contracts, for it may take a lawsuit, as it has many times in the past, to establish the contractor's rights under an oral agreement. If it is possible—although inconvenient—to obtain a written order, it should be obtained.

The rule that there may be a recovery for extras furnished under an oral agreement was recognized by the United States Circuit Court of Appeals, Third Circuit, in the case of Lord Construction Co. vs. United States, 28 Fed. (2d Series), 340. But the court notes that there must be clean-cut proof of the oral agreement, for the opinion says:

"A written contract may be waived by a parol agreement, but the evidence establishing it must (1) be clear and of a satisfactory character; (2) clearly show a distinct agreement by the parties that the work shall be deemed extra work; (3) show a definite agreement by the owner or contractor to pay for the extra work."

In the case of Headley vs. Cavileer, 82 Atlantic Reporter, 908, decided by the New Jersey Court of Errors and Appeals and cited by the United States Circuit Court of Appeals in the above cited case, these interesting sidelights on the antiquity of the law of the subject and the reasons for the courts' holdings are found:

"Disputes between contractors and owner as to extra work and changes on building or working contracts are as old as the practice of contracting for such work, and are a fertile cause of litigation. For very many years the effort has been to limit or prevent them by putting the main contract in writing, and stipulating, in effect, that changes and alterations must be agreed on in writing in order to support a claim for extra compensation. When there is an architect or engineer, he is usually brought into such a stipulation as arbiter or agent of both parties. In the case at bar there was no architect, but we conceive that this makes no difference in the principle to be applied. The court, early recognizing the beneficial character of such stipulation as tending to prevent trumped-up claims for extras and acrimonious disputes between owner and contractor, resulting in litigation, and loose testimony often running into perjury, endeavored as far as they could to give effect to such provisions, and occasionally succeeded. Miller v. McCaffrey, 9 Pa. 245 (1848).

"The fundamental difficulty, however, with which owners and courts had to contend, and which, in the absence of legislation, is insuperable, was and is that there is no statute requiring such contracts as the present one to be in writing; that parties who have contracted together have a right to cancel their contract, or alter it in any way not prohibited by law, or to supplement it by another and different contract, and, in cases of this kind, may do so orally in the absence of any statute requiring such contract to be in writing. Consequently no legal force could or can be given to stipulations of the character now under consideration as constituting a prohibition against the parties altering the main contract by mutual agreement. No matter how stringent such clauses may be worded, it is always open to the parties to agree orally or otherwise, upon proper consideration, that they shall be partially or entirely disregarded and another arrangement substituted. Were any different rule adopted, the right to contract would be to that extent impaired; so that, until the legislature sees fit to enact some statute of frauds covering this point, building contracts solemnly entered into writing and seal must be subject to radical change by the mere conversation of the parties if such conversation answers the tests of a contract at common law."

When Rejection Is Irrevocable

Sometimes a party to a business negotiation finds that he has taken an irrevocable step, preventing his securing the benefit of a favorable contract.

For example, it appears from the report of the case of H. D. Best Co. vs. Federal Terra Cotta Co., 231 N. Y. Supp. 483, decided by the Appellate Division of the New York Supreme Court November 23, 1928, that it was orally agreed that defendant would sell plaintiff a quantity of terra cotta at a certain price, on condition that the parties should execute the agreement in a written form satisfactory to defendant seller. Defendant tendered for execution a contract in the standard form used by it. Although it was not claimed that there was anything unreasonable about this form, plaintiff buyer refused to sign it and tendered for execution a contract in its own form. Defendant refused to sign it and later the plaintiff offered to sign the defendant's form, which had been previously rejected. But defendant refused to go ahead, and plaintiff sued for damages, on a theory that it had an enforceable contract for delivery of the terra cotta. The court decided that when plaintiff rejected the written contract tendered in the first instance that gave defendant the right to withdraw from further negotiations toward the sale.

Injuries to Travelers on Roads Under Construction

A passenger in an automobile was fatally injured one night on a Colorado highway under construction when the driver unexpectedly encountered an unlighted barricade. His widow sued the road contractors on the theory that the accident resulted from the latter's fault in failing to maintain proper warning. Trial of the suit ended in judgment in favor of the contractors, but the Colorado Supreme Court, in an opinion handed down May 14, 1928 (Lewis vs. La Nier, 270 Pac. 656), ordered a new trial on the ground that the trial judge had not correctly instructed the jury as to the rights and duties of road contractors and travelers in such cases. The opinion says, in part:

"It was the duty of the defendants to exercise due care—that is to say, such care as persons of ordinary care and prudence would have exercised—to warn the traveling public that the highway at that place was closed. If they did that, they were not negligent; if they did not do that, they were negligent. So far as the question whether the defendants were or were not negligent is concerned the manner in which the automobile was driven is wholly immaterial. If the defendants failed in the performance of their duty the next question would be whether or not such failure, i. e., such negligence proximately caused the accident. If it did, a further question ordinarily would arise, namely, whether the injured person was guilty of contributory negligence. That question is eliminated from the case by the defendant's statement that they make no such claim.

"By these instructions, the court, in effect, told the jury that if the automobile was not approaching with due care and caution, or if it was approaching without proper headlights, or even if the driver is not a 'careful driver,' the plaintiff, whose husband was merely a guest, cannot recover, even if the defendants had taken no precautions whatever, because in such case no duty to take any precautions rested upon the defendants. . . . Assuming that the driver . . . is not a careful driver; assuming, also, that on the occasion in question he was negligent in driving the car—this would not relieve the defendants from liability, if they were also negligent, unless the driver's negligence was the *sole* proximate cause of the accident."

Construction Industry News

The George Haiss Mfg. Co., New York, has announced the appointment of the Equipment Co. of Boston, 23-29 Island St., Boston, Mass., as its distributor in eastern Massachusetts, Rhode Island and the southeastern part of New Hampshire. The J. L. Hart Machinery Co., Tampa, Fla., has been appointed representative in the northern and eastern parts of Florida.

Bay City Dredge Works, Bay City, Mich., has announced a change in its name to **Bay City Shovels, Inc.** This involves a change in name only and is made for the purpose of more clearly indicating its present principal type of product, convertible power shovels. No change in organization will take place.

Metalweld, Inc., Philadelphia, Pa., manufacturers of Metalweld-Worthington portable air compressors, has announced the opening of a new office, show room and warehouse at 3918 South Wabash Avenue, Chicago, Ill., on March 1. Albert Watson, District Manager, is in charge of the office and also of the distribution from this point to all middle western dealers. He maintains a fleet of compressors for rental and a service department. In addition a complete stock of parts are carried at all times and a full line of Cleveland Pneumatic tools.

The Barber-Greene Co., Aurora, Ill., manufacturers of ditchers, loaders, conveyors, etc., has recently opened a new office in Cedar Rapids, Iowa, at 527-28 Merchants National Bank Building, under the supervision of Jack Marson. W. E. Toole at the same time opened a branch office under Mr. Marson at 1106 Nicholas St., Omaha, Nebr.

The William H. Ziegler Co., of Minneapolis, Minn., has recently opened a branch office in Fargo, N. D., which will be in charge of O. H. Strand. Mr. Strand, who has been a member of the Ziegler staff for about three years, will represent the accounts which the Minneapolis office handles, including a complete line of contractors' equipment and all kinds of material handling machines. Among the companies which Ziegler represents are Barber-Greene, Bucyrus-Erie, Chain Belt, Sterling Wheelbarrow, G. H. Williams, Fate-Root-Heath and Butler Bin Co.

Collins-Kay Machinery Co., Los Angeles, Calif., has removed its office, warehouse and yard to its own building at 3690 Santa Fe Ave., Los Angeles, Calif.

The Domestic Engine & Pump Co., Shippensburg, Pa., has announced the appointment of the Howard W. Read Corp., 800 North Delaware Ave., Philadelphia, Pa., as distributors for Domestic power pumps in the Philadelphia territory.

Cuyahoga Equipment Co., 5713 Euclid Ave., Cleveland, Ohio, has been appointed as distributor of Trackson tractor equipment for McCormick-Deering tractors.

The Cleveland territory, which is comprised of nineteen counties in northern Ohio, has been assigned to the Cuyahoga Co., who were also recently appointed distributors for Industrial McCormick-Deering tractors.

The Trackson Co., Milwaukee, Wis., announces that arrangements have been completed with the Thorman W. Rosholt Co., 928 S. Fourth Street, Minneapolis, Minn., for the distribution of Trackson tractor equipment for the McCormick-Deering industrial tractor.

The new distributors will handle the territories which are covered by the following branches of the International Harvester Co.: Fargo and Grand Forks, N. D.; Winona, St. Cloud, Minneapolis, and Mankato, Minn., and Eau Claire, Wis.

The Rosholt Co., will carry stocks of Trackson full-crawlers, loaders, shovels, cranes, bulldozers, etc., and will be able to make prompt deliveries on these machines as well as on repair and replacement parts.

The Columbia Products Co., Barberton, Ohio, has been formed as the selling organization for calcium chloride, plant lime, etc., manufactured by the Columbia Chemical Division, Pittsburgh Plate Glass Co. Officers of the Columbia Products Co., are all executives of the Columbia Chemical Division. The new arrangement offers the advantage of more direct relationship with customers and also the service of the up-to-date laboratories and research department at Barberton.

The American Hoist & Derrick Co., St. Paul, Minn., well known manufacturers of hoisting machinery and crawler type shovel-cranes, has opened a branch office at 139 Townsend Street, San Francisco, California. A large stock of new equipment and parts will be carried and every facility has been provided to insure on-the-ground service to all users of American hoisting machinery in Northern California.

The establishment of this branch office terminated a connection with Harron, Rickard & McCone, who handled the American line in San Francisco and vicinity for a great many years. Boyd Nixon has been placed in charge of the American Hoist & Derrick Co.'s San Francisco office.

Announcement has also been made of the appointment of F. E. Bauer, Jr., as Export Sales Manager, with offices at 50 Church Street, New York. Mr. Bauer has represented the American Hoist & Derrick Co., in foreign fields for many years and has a wide knowledge of business conditions in Asia and the Orient.

Blaw-Knox Co., Pittsburgh, Pa., has announced the merger of A. W. French & Co., of Chicago, with the Blaw-Knox Co., and its subsidiaries. A. W. French & Co., manufactures Ord concrete and asphalt finishing machines, Nu-Method finish graders, the new Ball wagon graders, etc. The personnel and policies of A. W. French & Co., will continue as heretofore and its plant and sales organization will function as a separate division of Blaw-Knox Co.

Chain Belt Co., Milwaukee, Wis., has announced the promotion of R. A. Shilbauer for the past several years Assistant Advertising Manager, to the position of Advertising Manager, succeeding A. R. Abelt, who will devote his entire time to his position as Sales Manager of the Chain and Transmission Division of this company.

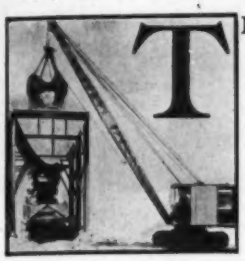
Manitowoc Engineering Works, Manitowoc, Wis., manufacturers of speed cranes, shovels, draglines and trench hoes, as well as Manitowoc-Buffalo buckets, has announced the appointment of the Condon Bearing & Supply Co., Pittsburgh, Pa., as its representative in Western Pennsylvania and West Virginia.

Aeroil Burner Co., West New York, N. J., have recently opened a branch office at 176 North Wacker Drive, Chicago, Ill., where a complete line of Aeroil burners and parts will be carried in stock.

Where Do the Cost-Boosters Live on Your Machines?

By Russell Byron Williams

American Cable Company

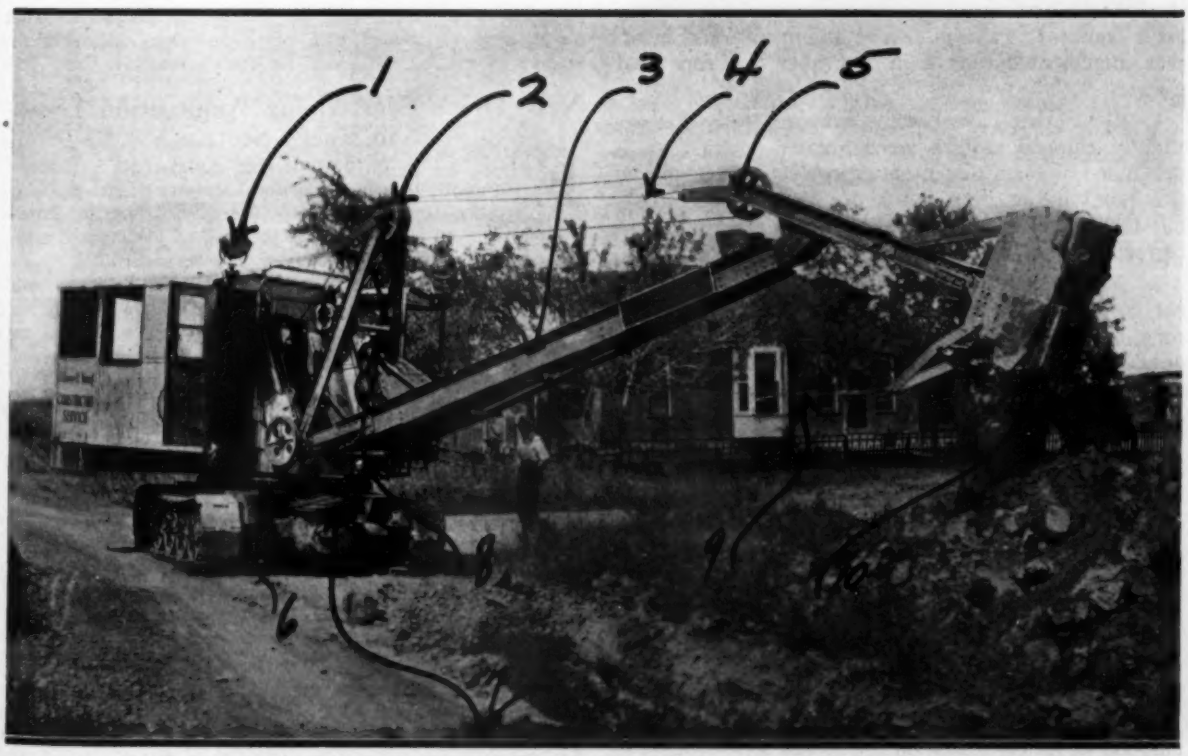


THERE is an old fable to the effect that a tiny ant once saved the life of a huge elephant. That fable, for the contractor, means "pay attention to the details."

A few years ago a large Chicago printing establishment was compelled to stop its presses and close its doors all because of an $18-a-week girl. The printing house had nearly completed an exceptionally large contract for mail order catalogs. Paper had been purchased by the car load. Engraving and composition costs had been enormous. The work had been printed in colors, the forms gathered and bound and the books made ready for trimming. In this last operation the girl who operated the trimmer set the knife about a quarter of an inch too far forward and trimmed the printed prices off every article in the catalog, instead of merely trimming the edges. Firing the girl failed to keep this printing firm out of the bankruptcy courts.

While production in contracting is somewhat removed from that of printing, the story none the less illustrates the importance of details, the costliness of even so small a thing as a quarter-of-an-inch, and the apparent ease with which not only profits may be cut and costs boosted but sheer existence trimmed. In and about every piece of mechanical equipment there are countless details that require constant watching if operating costs are to be kept at the minimum.

Illustrated here, as an instance, is a large crawler-type ditcher excavating for a sewer in the suburbs of Denver. By merely looking at the photograph or by visiting a similar job one could not tell how many or where the cost boosters have their abode. To force home the importance of such details and the insidious menace of all small leaks we have indicated by arrows and numerals only ten places that commonly harbor cost boosters. Those indicated are by no means the only ones that can infest any average similar operation. They have been selected merely to afford a striking example of the losses that can be and are being sustained by literally hundreds of ditchers throughout the country.



A Crawler Crane with Ditcher Attachment Excavating for a Sewer at the Denver Municipal Water Works, Denver, Colo., with Special Added References Noted in the Text

ABODES OF THE COST-BOOSTER AND PROFIT-NICKER FAMILIES

1.—A layer of dust over this lens, or dust which might have filtered into the lamp and settled on the reflector or bulb, will reduce the quantity of light by an astonishingly large percentage. If bulbs burn out and the replacements are not of the proper construction there may develop expense either through repeated destruction of the bulb or loss of lighting efficiency.

2.—Watch the sheave grooves. If they are worn, excessive abrasion is set up and the outer wires or the rope will be subjected to undue wear and early breakage. If the sheave is not of the proper size the rope will be pinched—and a pinching sheave can do more damage to a wire rope in one hour than a proper sized sheave could possible do in an entire month—and that is no exaggeration. Sheaves are more easily replaced and much cheaper than good wire rope.

3.—Metal surfaces should be given a coat of anti-rust at least once in every six months. There are a number of excellent coverings on the market—some better adapted to particular uses than others. Consult a recognized authority or call in the representative of an established firm who advertises.

4.—Frequently inspect the seizing or clamping to wire rope since here is a place where slippage may remain unnoticed—until a load falls to the injury of both equipment and workmen. If preformed wire rope is used, seizing is unnecessary as the rope will not unravel.

5.—All sheave bearings should be constantly watched for alignment and wear. Lack of proper lubrication at this point imposes unnecessary wear and rapid depreciation, while the constant side swinging of the loads are a constant strain on sheave alignment—and incorrect alignment means high mortality for rope and sheaves.

6.—Gears that have become worn or teeth that are slightly chipped require much greater power than is demanded of gears that mesh properly. Lubrication at this point means long life and satisfactory service—but lubrication can also mean needless expense, if the correct type of grease or oil is not used.

7.—Wire rope should not be handled in a manner similar to that of rubber hose or hemp rope. Wire rope, not of the preformed type, will kink readily and once a kink has been formed no amount of strain will ever get it out. In changing from the shovel to the crane boom or vice versa, the rope should be handled by lifting the coil to its edge and rolling or unrolling along the ground.

8.—If the operator should get into the habit of slowing up or stopping at 4:45 instead of 5 o'clock, he will, over the course of a 300-day work year, waste 75 hours of production time.

9.—Make certain that the load is not in excess of the rope's or chain's rated capacity. Constant, or even occasional, over-loading is both harmful to equipment and a menace to workmen.

10.—Keep the dipper teeth sharp and full. A dull, chipped or broken tooth on the dipper will demand as much as 50 per cent additional crowding power—and power is nothing more than fuel, in finished form.

Carpenter's Horses Made of Welded Scrap Angle Iron

Welded Carpenter Horses of Scrap Iron

WITH the increasing use of oxy-acetylene welding by contractors, more and more ingenious methods are being devised for using scrap metal. Practically any contractor needs a pair or two of carpenter's horses and there are very few contractors who are without these handy accessories. The trouble with most carpenter horses lies in the fact that they are usually made of wood and have a tendency to break or spread after they have been subject to any hard usage.

A welder in an Eastern shop, realizing this, constructed a pair out of scrap angle iron. The finished product was an agreeable surprise to the carpenter's gang and a great improvement over the wooden ones that had been used in the past. It was a simple task to weld these pieces of scrap together. The accompanying illustration shows clearly the construction of the horse and the location of the welds. The pieces were all welded with butt-type joints and a small amount of welding rod added for extra strength.

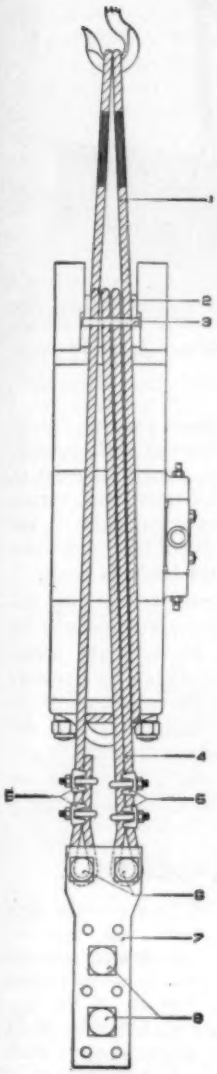
New Drive Started for Arbitration Laws in Every State

EFFORTS to have the forty-eight states enact arbitration laws patterned on the national statutes passed in 1925, are now being made by the American Arbitration Association. The work of extending the field of commercial arbitration to all parts of the country will be undertaken by an executive council of the Association which, in addition, will seek to enlarge the system of tribunals which the Association now has in 1,500 cities. The Council will also inaugurate an educational movement among business leaders in favor of settling commercial disputes without going to law.

The members of the Executive Council are General James G. Harbord, President, Francis S. Sisson, Chairman, General Samuel McRoberts, Treasurer, and Charles L. Bernheimer, Clement M. Biddle, Colonel Franklyn Q. Brown, Irving T. Bush, Louis K. Comstock, Donald K. David, Moses H. Grossman, Charles T. Gwynne, Francis R. Henderson, Horace F. Howland, Henry Ittleson, John R. Kilpatrick, C. Stanley Mitchell, Frank C. Munson, James H. Post, Arnold C. Pouch, Henry H. Rosenfelt, Lewis L. Strauss, H. R. Swartz, Alfred H. Swayne, Herbert Bayard Swope, Richard H. Waldo and Benjamin L. Winchell.

Under the common law, all arbitration agreements are illegal, a condition which is being remedied by state statutes. Arbitration has been called "The most humane way of settling disputes." Statutes legalizing arbitration are to be introduced by business interests in Connecticut, Iowa, Kansas, Michigan, Missouri, Nebraska, Ohio, Tennessee, West Virginia and Wisconsin.

Pile Pulling with Pile Hammers



Rig for Holding Pile Hammer When Pulling Steel Sheet Piles

WHEN steel sheet piling was first introduced, it was only natural that contractors should look about for some method of pulling the sheet after it had served its purpose. It was found that steam pile hammers made by the McKiernan-Terry Drill Co., 15 Park Row, New York, accomplished this work admirably and today these hammers are used throughout the world for both driving and pulling.

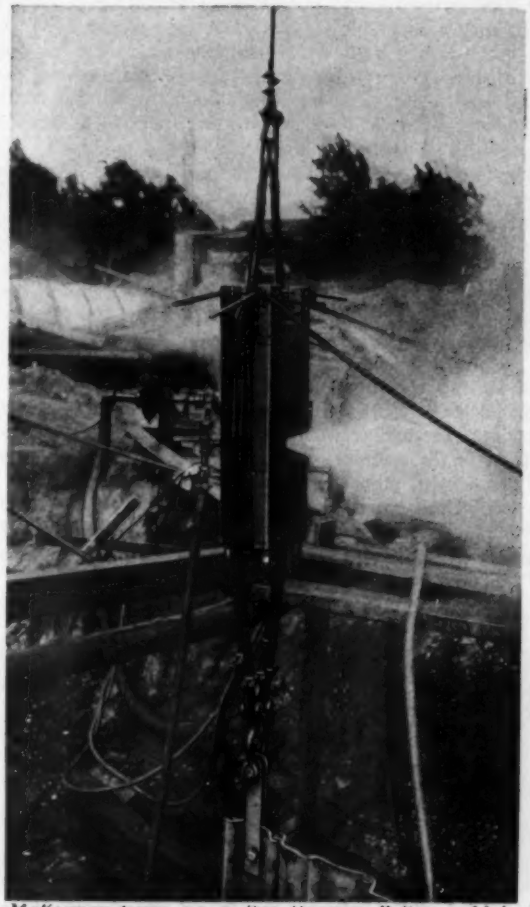
Various methods of pulling sheet piles by inverting McKiernan-Terry steam hammers may be employed. It is simply a matter of attaching the inverted pile hammer to the pile and exerting a steady pull upon the hammer by means of a derrick. The force of the hammer blows is thus transmitted to the piling together with the pull of the derrick line. For attaching the hammer to the pile, either steel straps or wire rope or a combination of both can be used. For average work, wire rope when properly used is the least expensive and most satisfactory.

Whatever method of rigging is used, sharp turns should be avoided. A half-round block of wood or iron, preferably the latter, should be placed on top of the anvil block of the inverted hammer to make an easy turn for the pulling table or bar which passes around the hammer. It is not advisable to support the hammer by hitching to its four lugs or feet, but if this is done, the lugs must be braced so that they cannot bend inward toward one another. It is better to have the rope or bands pass completely around the hammer.

Omitting from consideration any piles that have been distorted in driving, the time required to start piles moving in pulling with an inverted hammer is about the same as the rate of penetration in driving just before removal. A No. 6 McKiernan-Terry pile hammer weighing 2,900 pounds will pull any piling which requires for driving a hammer at least three times its weight, according to the manufacturer.

A wire rope pulling rig is made and sold by this company and is recommended by it as preferable to more expensive rigid rigging for the average run of work. It is made of parts which can be easily repaired or replaced on the job without difficulty. It is easy to attach this rigging to the hammer. A saddle block is provided to fit between the lugs of the hammer with grooves to keep the cable in the proper position. A retaining ring also holds the cable firmly in place between the lugs. Two spliced eyes in the sling at the top are of ample size for any derrick hook. The cable is attached to the pile clamp in such a way as to give all parts the same strain. Holes in the pile clamp plate are 2¼ inches in diameter and 8 inches center to center.

This pulling rig is not subject to fatigue or failure from vibration as a rigid steel rig is and wear on the cables can be seen in ample time for renewal before they are likely to break. This design also enables the operator to lay the pulled pile on the ground without taking another hitch as the flexible cable permits disengaging the clamp in any position.



A McKiernan-Terry No. 6 Pile Hammer Pulling a 14-Inch Arch Web Steel Sheet Piling

Crawler Tread Excavating Equipment in Five Models

EXCAVATING and material handling equipment, including Model A, a ⅝-yard shovel, Model G, a 1-yard shovel, Model T, a ¾-yard shovel, Model W, a 1¼-yard shovel and Model C, a 35-ton crane with 60-foot boom, has been announced by the Orton Crane & Shovel Co., 608 South Dearborn St., Chicago, Ill. Each of the first four models is convertible to a crane, clamshell, dragline, ditcher or skimmer, while the last, Model C, is convertible to a clamshell and dragline.

The flexible crawler treads for Orton machines are self-cleaning and are of the spring type with a series of springs between the sprocket wheel and the idler wheel, carried by an equalizer strut provided with two rollers. The rollers bear directly on the flat inner surfaces of the shoes and the springs support the upper structure of the machine. The springs are virtually the balloon tires of crawler treads. The use of heavy section roller steel shapes for building the base of Orton machines gives strength and uniformity of material. Electric welding is used to reinforce the structure in addition to ample bracing and riveting.

All Orton machines of ¾-yard capacity and larger are provided with a roller bearing swing. A large diameter turning rail consisting of a T-rail bent in the form of a circle is riveted and electric welded to the upper surface of the base and a similar rail is anchored to the under surface of the turntable. Between thees two turning rails is a series of wheels with chilled treads which are held in position by pins and spacer bars. The action is the same as that of a roller bearing. The main hoist shafts and drums, boom shaft hoist, swinging shaft and propelling shaft are mounted on two heavy cast side frames which are rigidly bolted to the turntable center casting and firmly braced by cross bars. Only four power shafts are required by the operating mechanism. Each power shaft carries a clutch for controlling its particular function so that traveling, hoisting, crowding and swinging can be performed independently or simultaneously. No clutch is used for two operations.

Simplicity of control is gained by mounting the hoist lever, swinging lever and crowding lever in one bank immediately in front of the operator's position. The levers for controlling the boom hoist, propelling and engine clutches are banked at the left of the operator. Foot and hand brakes for the different functions also are conveniently placed. All of the main bearings are lubricated by the Alemite-Zerk pressure system.

A Model A ¾-Cubic-Yard Orton Shovel, Showing the Advantageous Location of the Operator and the High Lift of the Shovel

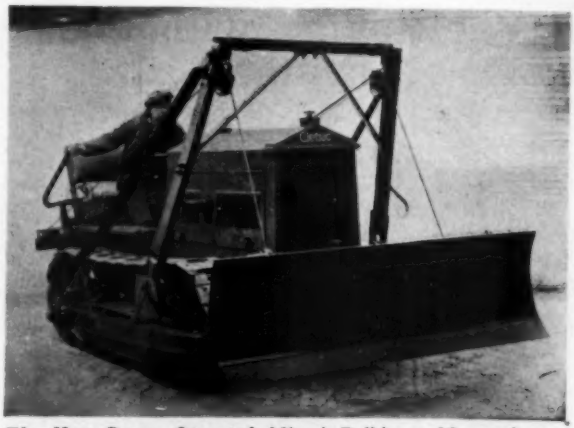
The boom is raised and lowered by a cut forged steel worm in conjunction with a bronze worm wheel keyed to the boom hoist drum. The worm drive makes it necessary to use power for lowering as well as raising the boom, thereby eliminating the possibility of dropping the boom through the accidental release of the brake or pawl. All Orton machines have as standard equipment an electric starter, pressure lubrication, governor and a Twin Disc clutch mounted in the flywheel.

Substantial construction is insured by making the cab of heavy gage steel sheets which are firmly supported and amply braced. Complete enclosure is provided, thus protecting the operating mechanism from the elements.

A New Power-Operated Bulldozer

A NEW power-operated bulldozer for the Cletrac 30-A which attaches to the standard Cletrac extended axle and in which is incorporated a number of new features has been announced by the Miami Trailer-Scraper Co., Troy, Ohio. This bulldozer is entirely independent from the tractor drawbar and therefore does not interfere with the free use of the tractor as a pulling unit or for similar purposes.

The blade of this bulldozer, which is 7 feet in length, is carried on heavy H-beams and is raised and lowered by two steel cables attached to the ends to insure an even lift in places where one end only of the blade is under load. Suitable rub plates eliminate all side movements. Another feature of this machine is the mounting of the A-frame, which carries the cables, by means of a universal connection, direct to the track frame, thus allowing the blade to follow the ground contour, and minimizing any tendency of the blade to gouge.



The New Power Operated Miami Bulldozer Mounted on a Cletrac Thirty

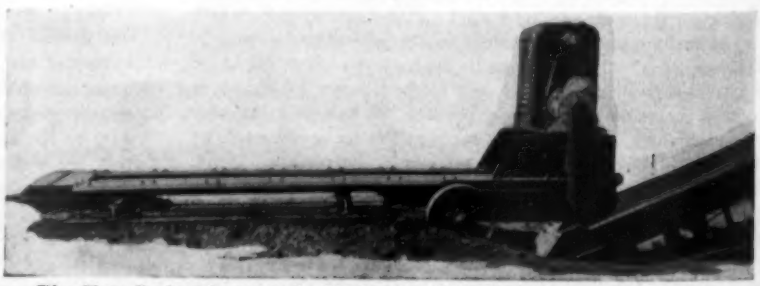
The Miami power winch manufactured for use with this model is so designed that the same winch which operates the bulldozer is also available for power use with the Miami power dump trailers and scrapers, as well as for ordinary winch uses. The winch drives from the power take-off of the tractor with a double roller chain through a multiple disc clutch designed integral with an over-running brake which permits the tractor operator, by means of only one lever, to control all movements of the load.

A New Belt Feeder

A NEW belt feeder for unloading all bulk material such as sand, gravel, slag, crushed stone, coke, fine ore, moulding sand and any other free flowing material usually transported in hopper-bottom cars, is manufactured by the Barber-Greene Co., Aurora, Ill. The use of this machine eliminates the necessity of digging a pit under the tracks as this feeder can be set up beside the track with only a small pit on the outside of the track for the conveyor hopper at the discharge end of the feeder.

The machine may be used either over the rail or under it as required, the maximum thickness through the feeder being 4 1/16 inches. With this feeder it is possible to unload an entire car of material without shoveling.

Either an electric motor or a gasoline engine can be used to drive the feeder. With a gasoline engine the entire machine weighs 1,690 pounds while the electric-driven feeder weighs 1,520 pounds.

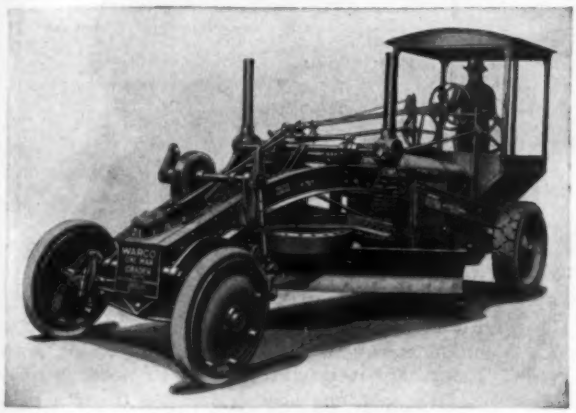


The New Barber-Greene Belt Feeder for Unloading Hopper Bottom Cars

A Grader with New Lifting Mechanism

THE new Warco screw lift grader, which is manufactured by W. A. Riddell Co., Dept. F, Bucyrus, Ohio, utilizes a unique lifting mechanism. Two hand wheels located in the cab which is at the rear of the grader operate the screw through circle controls. The blade is thus easily raised and lowered. The Warco screw lift is built like a screw jack, a heavy, high carbon screw being used. The mechanism is actuated by this large machine-cut steel screw turning in a machine-cut bronze nut and gear of one piece construction, having a thread contact equal to 60 inches. The nut and gear are driven by a machine-cut high carbon steel pinion and shaft, forged integral, which is connected by a shaft running to the cab. The gear and pinion are enclosed in a grease tight housing.

Another feature of the new rear-control, one-man Warco grader is the newly designed circle, having a large steel casting in the center with machined top and bottom, supported between guides at three points on the draw bar with provisions for take up in case of wear. Extra heavy bars are hot riveted to the circle and extend far out on either side to support the blade.



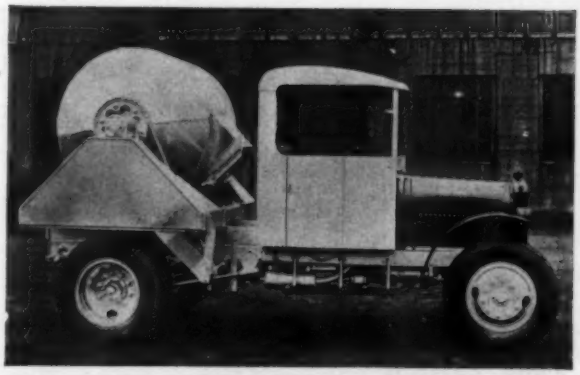
The New Rear-Control, One-Man, Screw-Lift Grader

An Agitator Body for Hauling Mixed Concrete

A ROTARY body for transporting mixed concrete has been developed by the Avril Tru-Batch Concrete Co., Cincinnati, Ohio, in corroboration with the LeBlond-Schacht Truck Co., Cincinnati, Ohio. This body has a number of unusual features.

The capacity of the cylinder is 2 cubic yards when loaded to about two-thirds from the top. It is necessary to leave the remaining space free so that the concrete will be agitated as the body revolves, instead of moving as one solid mass. The horizontal axis of the body is transverse to the longitudinal axle of the truck and is about 2 inches ahead of the rear axle of the truck, placing most of the load on the rear axle. The rotating body is driven by means of a chain from a worm speed reducing unit through a specially designed, ball-bearing equipped transmission power take-off. The body can be varied to meet different requirements and rotates on a special self-aligning SKF roller bearing. The body can be operated independently of the truck operation. The body is filled and emptied by means of a water tight door operated by a gear and ratchet mechanism with hand crank.

The body is mounted on a Schacht chassis of 2½ tons capacity and is powered by a 6-cylinder Waukesha 3¾ x 4½



A Schacht Truck with Avril Tru-Batch Body for Hauling Ready-Mixed Concrete

engine. It has a wheelbase of 126 inches and is equipped with 34 x 7 pneumatic heavy duty tires with duals in the rear mounted on Budd wheels.

Three of these trucks in the service of the Avril Tru-Batch Concrete Co., made a round trip of 3 miles and poured 142 cubic yards in 5 hours. The concrete received a 2-minute mix before being placed in the truck body. Tests have shown an actual increase in strength in the mix at the end of a 3-mile haul.

Mechanical Distributors for Road Work

THE Handy Sandy mechanical distributors which are manufactured by Highway Service, Inc., New Bedford, Mass., are designed for use in secondary coverings in surface-treatment work, for dusting bleeding roads, for dressing shoulders, for resurfacing gravel, cinder or shell roads, for calcium chloride treatment on dusty highways or for any job where a material is to be uniformily distributed. Ordinarily the operator rides on the platform at the rear and manipulates the clutch for starting and stopping the feed and regulates the depth of the spread by the manipulation of the levers at either side. Anything from a mere sprinkle to 2½ inches in depth may be obtained and the distribution may be heavier on one side than on the other if desired, by pushing one lever down and the other up.

Model 66 Handy Sandy is designed for use with trucks up to 1½ tons and inside body widths up to 5 feet 6 inches. It is equipped with one adapter and two carrying chains. The Model 80 is for trucks of 1½ tons or over and body widths up to 7 feet.

The method of carrying the distributor is shown in the illustration. It is attached to the tail board in dumped position

Method of Carrying Handy Sandy on the Back of a Truck

A White Truck with Handy Sandy Attached Ready to Spread

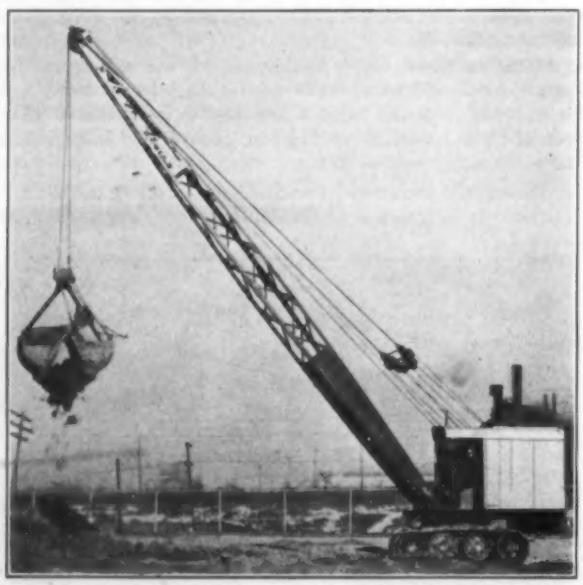
by chains which are adjusted to such length as to raise it some 6 to 10 inches from the ground. Under conditions where close regulation of distribution is not necessary, advantage may be taken of this method to start and stop the feed and in this manner one man may control both the truck and the distributor.

A New 1-Yard Center Drive Crane

A NEW Thew 1-yard center drive crane-clamshell-shovel-dragline, known as the Lorain-55, and similar in design and construction to the Lorain-75, is now manufactured by the Thew Shovel Co., Lorain, Ohio. All the features of the 75, rugged strength, long range, direct power, high speeds, positive 3-lever control, have been duplicated in this new 55.

The crane is mounted on a 2-speed, heavy duty center drive truck. The turntable drive is a direct drive from the motor to the 3 power shafts through a minimum of parts, gears and weight. All three power shafts can be engaged at once, giving 3 simultaneous operations, independently controlled.

As a shovel, the Lorain-55 has a long range secured through the center drive boom. The main features of this boom are the central position of the shipper shaft in the boom, plus the dipper stick end rack which makes possible crowding out the stick to its very end. The crowding mechanism is very simple, consisting of one shaft, one pinion and a driving sprocket. An automatic crowd brake holds the dipper stick in any dumping position without back drift, and permits holding the stick and using full power for hoisting just like a steam shovel.

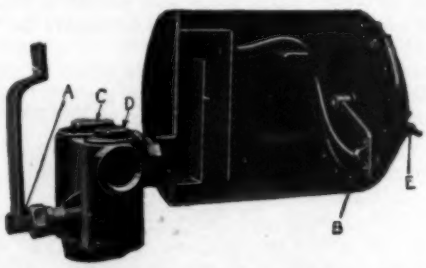


The New Lorain-55 1-Yard Center Drive Crane with 35-Foot Boom

For bin-charging, material rehandling, excavations and back filling, the center drive turntable drive makes possible hoisting, swinging and traveling or derricking the boom, all at the same time. The new box-section latticed steel boom is available in 35, 40 or 45 foot lengths. Center sections can be supplied to furnish longer booms. The power-driven self-locking worm boom hoist is equipped with a secondary automatic safety brake. A six-part boom hoist and an equalizing boom harness are used.

For use as a dragline, the Thew fairlead speeds up operations and reduces cable wear. It consists of 2 large sheaves in tandem, giving a long cable lead to the drum. The pivoted lower sheave handles the cable leads from all angles. The clamshell tagline also utilizes this pivoted sheave feature.

The power unit is either a Waukesha JL 4-cylinder gasoline engine or an electric motor.



The Knickerbocker Water Measuring Device

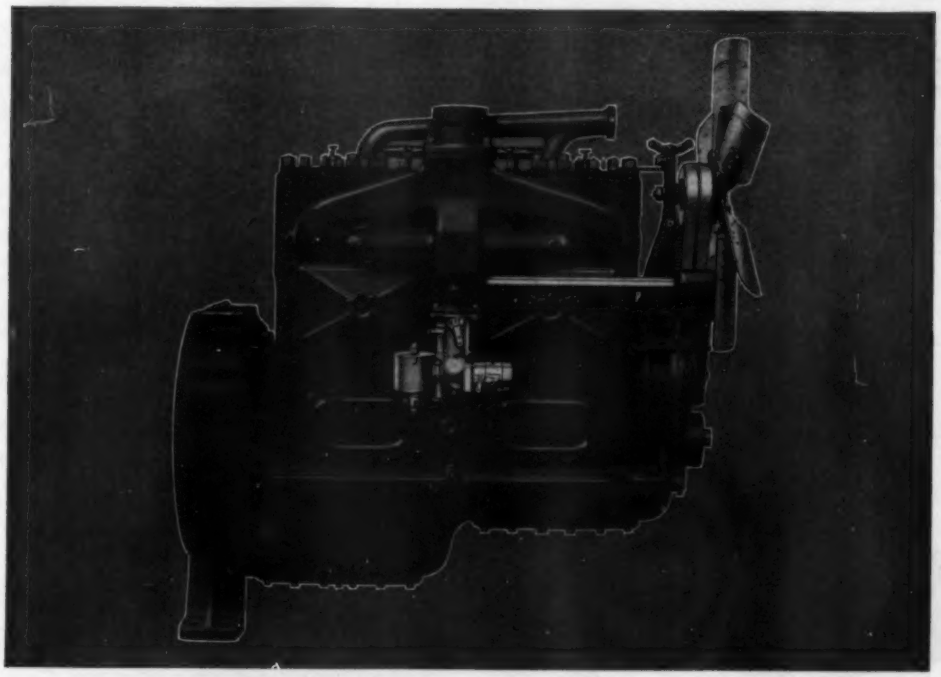
A New 10-S Mixer

A NEW side-skip-loading, non-tilting, 10-S mixer has been brought out by the Knickerbocker Co., Jackson, Mich. The mixer is equipped with Hyatt roller bearings throughout. The cast iron housing over the trunnion roller shaft is packed with grease and can be filled up and forgotten by the contractor throughout the construction season. This not only relieves the contractor of considerable responsibility, but also lengthens the life of the machine and further protects the trunnion shaft from mud and concrete.

This Knickerbocker mixer continues the use of the replaceable drum track. The trunnion rollers are case hardened and ground and keyed to the shaft. Since the trunnion rollers revolve five to seven times to one revolution of the drum track, this hardening enables them to take the wear readily and the replaceable drum track can easily be changed when worn or damaged in any way. The drum track carries the flange rather than it being on the trunnion roller, thus lessening the wear on the flange.

The mixer has one-man end control with all of the levers located readily within reach. The skip has a 55-degree discharge angle and an automatic limit after the lever is thrown so that it is not necessary for the operator to watch it. The cable sheave on the skip is coned with the cable operating on the small end at the start and at the large end when it reaches its maximum elevation. The sheave has a cast iron cover to protect it from objects falling onto the sheave and from the weather.

This mixer has the Knickerbocker system of accurate water control where the water is admitted to the measuring tank through a 2-inch inlet valve, D, filling the tank completely when the check valve at the top closes. The water in the tank is under pressure. Moving lever, A, closes the 2-inch inlet



Waukesha Heavy-Duty Four

L-HEAD ENGINES
THEY TAKE BETTER CARE OF THEMSELVES

The New Waukesha Heavy-Duty Four is specially designed for construction machinery. Particularly adapted for driving shovels, cranes and other contractors' machinery, it is sturdy, reliable, easy to start and easy to run.

The genuine Ricardo Head, extra deep crankcase, splash and pressure lubricating system, large volume cooling system and Waukesha built-in governor, are features of prime importance to users for they assure long life and economical operation.

The Waukesha Heavy-Duty Four is built in two sizes—5½-in. by 6½-in. and 6-in. by 6½-in.—recommended for 70 hp. and 85 hp. respectively.

Write for bulletin No. 710. It describes Waukesha engines, both Fours and Sixes, designed especially for cranes, power shovels and other industrial machinery.

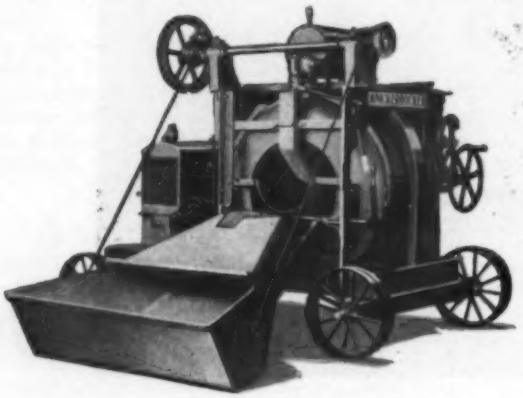
924 *INDUSTRIAL EQUIPMENT DIVISION*

WAUKESHA MOTOR COMPANY

New York Tulsa **Waukesha, Wisconsin** Houston San Francisco

Exclusive Builders of Heavy-Duty Internal Combustion Engines for Over Twenty Years

valve and opens the 3-inch outlet valve, C. The water then siphons from the tank until its level reaches the open end of measuring tube, B, allowing air to be drawn into the top of the siphon and breaking the suction, the flow of water being stopped instantly with no dribble. The measuring tube, B, can be moved through an arc of 180 degrees from the top to the bottom of the tank and can be set at any desired point on its arc by means of a wing nut, E, on the rear end of the tank. A scale, graduated in quarts, is placed on the quadrant so that any desired amount of water may be secured. After the tank is emptied of the desired quantity of water, the lever, A, is moved back into its original position, closing the outlet valve and opening the inlet valve, allowing the tank to refill and completing the cycle of operation. Access to the interior is effected by means of a removable rear head.



The New Knickerbocker 10-S Mixer

A flange or apron on the mixer drum prevents any slop from flowing back on the drum and down onto the rollers. The chassis is of Cumberland steel and the entire job is built from jigs. It is equipped with a LeRoi 10-12-horsepower, radiator-cooled, 4-cylinder engine. The mixer is mounted on full-spring suspension with either steel or rubber tired wheels. It is also equipped with automobile steering knuckles on the front when desired. The frame is electric welded and the skip is well reinforced being both bolted and welded. The skip can be raised and charged in 6 seconds and a batch can be discharged from the drum in 6 seconds.

A Pneumatic Concrete Surfacer

A PNEUMATIC tool for finishing and smoothing concrete, eliminating form marks, and finishing and polishing stone work, has been announced by the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y. This No. 33 surfacer is well adapted for rounding corners and edges and bringing stone to a highly polished surface.

For concrete work, a No. 20 coarse grinding wheel with wheel head complete is used. There is also a cutting attachment consisting of a head with 7 sets of steel burring wheels and then a grinding wheel which is used to smooth up or remove form marks from fresh or green concrete and it can also be used to give a pebbled finish. When a finer finish is wanted, water is brushed on the surface before grinding. The cutting attachment is recommended by the manufacturer for removing form marks or high spots from old concrete or concrete that has taken a permanent

The New C-P Concrete Surfacer

set. By using the grinding wheel after the cutting attachment a finer finish is secured.

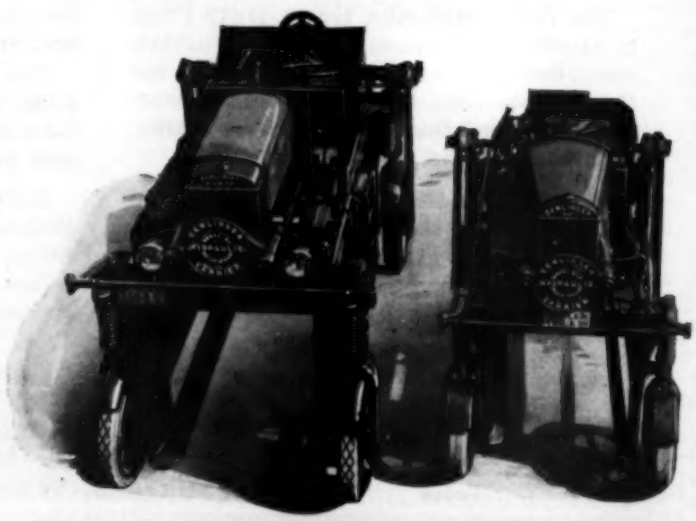
The tool which weighs 15½ pounds has three cylinders, each cylinder being provided with its own valve of the piston type allowing extremely short live air ports. The piston and toggles are of the pin type and the vent tube is of the centrifugal ball check type. When the machine is at rest the ball check is seated, preventing the loss of lubricant due to oil, moist or submerged vent. Any one of the three cylinders, pistons, rods or valves may be disassembled without disturbing the other two assemblies. Removal of the grip handle and one cylinder permits the removal of the crank shaft. Should any cylinder require replacement for any reason, it is quickly replaceable without disturbing any other element.

A Material Handling Tractor

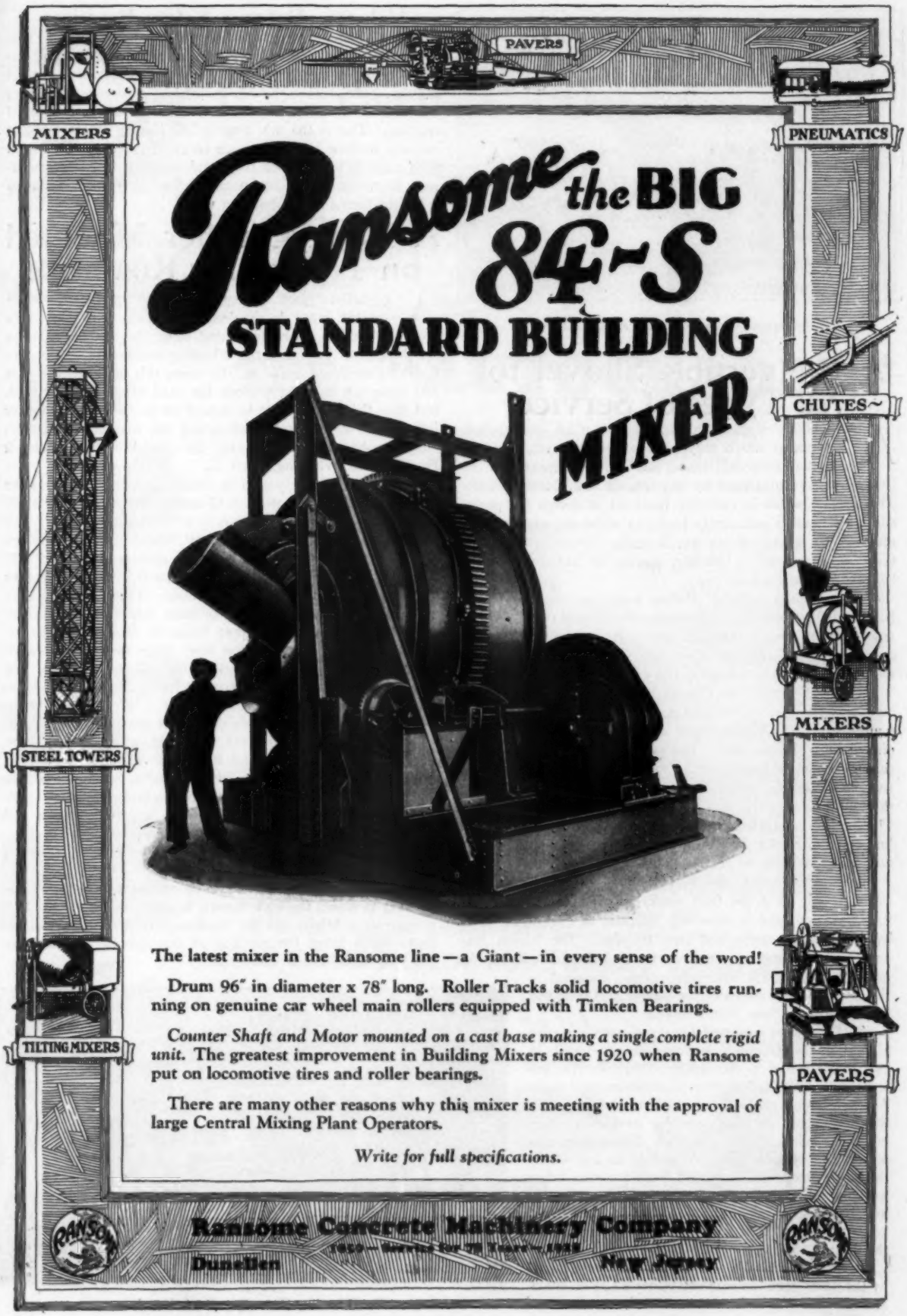
A TRACTOR developed particularly for handling materials such as lumber, brick, steel, pipe, tile, bags of cement, poles, etc., and which has already proved very helpful in the freight field, has a number of advantages in the construction field. This Gerlinger hydraulic lift haul carrier consists of a high frame, as illustrated, capable of carrying loads 3 feet wide by 3 feet high and of any length when taking material from a freight car. In general use or on the highway the machine can handle material 4 feet x 4 feet by any length. The operator, seated at the top of the machine, has a clear view of the path he is to travel and has complete control of the machine at all times.

This machine is readily adaptable to handling large loads of lumber and loads of brick direct from freight cars to the job, as it is so constructed that it may operate through city streets, narrow alleys and even in and out of box freight cars. To pick up a load the machine runs over the material which is stacked so as to leave floor clearance for the lift shoes, then by the hydraulic jack the entire load is picked up and without rehandling is transported to its destination.

This machine is made in two sizes, Models No. 0 and No. 2 by the Carrier Division of the New York Air Brake Co., 420 Lexington Ave., New York.



The Two Sizes of Gerlinger Hydraulic Lift Tractors for Carrying Materials That May Be Stacked


PAVERS
MIXERS
PNEUMATICS
Ransome the BIG 84-S
STANDARD BUILDING
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CHUTES
MIXERS
STEEL TOWERS
TILTING MIXERS
PAVERS
The latest mixer in the Ransome line—a Giant—in every sense of the word!
Drum 96" in diameter x 78" long. Roller Tracks solid locomotive tires running on genuine car wheel main rollers equipped with Timken Bearings.
Counter Shaft and Motor mounted on a cast base making a single complete rigid unit. The greatest improvement in Building Mixers since 1920 when Ransome put on locomotive tires and roller bearings.
There are many other reasons why this mixer is meeting with the approval of large Central Mixing Plant Operators.
Write for full specifications.
RANSOME
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The Osgood Conqueror Convertible Shovel

A Convertible Shovel for All Types of Service

A RUGGED, sturdy and reliable piece of construction equipment which may be used as a shovel, backhoe, dragline, clamshell, crane, pile driver, or magnet is the Conqueror, manufactured by the Osgood Co., Marion, Ohio. This shovel, which is carefully balanced in design for power and speed, and is sufficiently heavy to withstand severe treatment in all classes of service, is easily converted from one type of equipment to another, merely by changing booms, buckets and wire ropes.

The Conqueror has an all-steel house or cab fitted with large and ample doors of both sliding and hinged type, moulded from pressed steel. The sides are made of special stretched steel plates. An electric dome tail and head lights provide illumination from a storage battery for night work.

For shovel service, the Conqueror uses a combination wood and steel armored boom and handle. The handle is of the double stick type and is fitted with special steel racking and pinions on a shipper shaft. The rack and pinions are operated through a special application of the wire rope crowd which is so reeved that no power is taken from the hoisting line, yet the crowding action is double the line pull in the hoisting line. The harder the digging, the greater the pull on the dipper hoist line and the harder the crowd will dig in. It is automatic in action and requires no slack take-up for the cables.

The machine with the backhoe attachment, which may easily be put on in the field, works on solid ground ahead of its excavation, and is especially adapted to excavating small basements, and sewer and pipe trenches. The bucket may vary in inside measurement up to 42 inches as may be required. A powerful differential drum, mounted in the gantry frame, increases the pulling action on the bucket to more than 20,000 pounds.

The Conqueror equipped for crane service carries a boom of the structural, latticed bow type, made in two pieces bolted in the center. Point sheaves are large, with machined grooves to minimize rope wear. A special rope guide is provided at the boom tip which prevents the rope jumping its sheave. For magnet service a generator, belt driven from the motor, can be furnished. A built-in tagline within the boom keeps the clamshell bucket steady when working. When a dragline bucket is used a universal or self-adjusting fairlead is furnished. This fairlead keeps the ropes aligned in relation to the bucket and the drum.

Specifications for the Conqueror are determined by the users' requirements and either a LeRoi, Buda, Hercules or Waukesha motor may be used.

Valuable Data on Safety Practices

THE Committee on Accident Prevention of the New York Building Trades Employers' Assn., is now engaged in compiling reports of safety practices of general and sub-contractors in the city in order to determine the causes and sources of casualties on structures under the course of erection. This is the first time in the history of the building industry in New York that such an effort has been made on a wide scale to gather such data, and is a part of the Committee's determined and concentrated effort to reduce the number of accidents in construction work.

A Rock Crusher Mounted on Tractor for Road Use

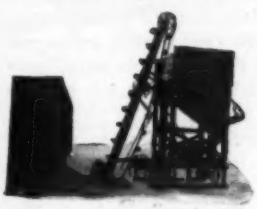
A USEFUL piece of equipment for road jobs where crushed stone is required and where it is desired to crush the stone distributed along the road in order to cut the cost of hauling is the Wheeling crusher mounted on an Eagle 30-horsepower tractor. By using this machine, the rock and stone can be crushed along the road where it is required, and then the machine can be moved on to the next section or job without any delay or dismantling the crusher. This traveling crusher is manufactured by the Wheeling Mold & Foundry Co., Wheeling, West Va.

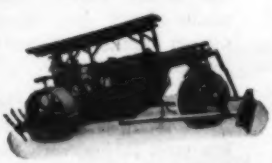
The crusher which is used on this piece of equipment is the Wheeling 2½ crusher, size 8 x 15 inches, with a capacity of 50 to 70 cubic yards per day or 6 to 10 tons per hour on 2-inch material. This is one of the many Wheeling crushers which are made in a variety of sizes with jaw openings of from 6 x 12 inches to 48 x 60 inches, ranging in capacity from 2 to 3 tons per hour to 300 to 400 tons per hour. These crushers have all-steel one-piece frames and pitmans equipped with bronze or roller bearings and counter balanced flywheels. The reversible jaws are of manganese steel, while the eccentric shaft is of nickel steel and the cheek plates and guards are of cast steel. The crusher can be turned over by hand and operates without any vibration.

The tractor on which this crusher is mounted is an Eagle 30-horsepower crusher tractor Model H, of the 8-inch bore, 8-inch stroke 2-cylinder and horizontal valve in head type. It has a Pickering governor, Dixie magneto, Schebler kerosene and gasoline carburetor, Madison Kipp lubrication to the cylinders, a steel channel frame and heavy duty transmission with Hyatt roller bearings. The rear wheels are 52 inches in diameter with a 12-inch face while the front wheels are 32 inches in diameter with an 8-inch face.

With this machine the job can be commenced at the end of a string of stone, the rock thrown into the crusher which is at a convenient height and the machine driven over the crushed rock, which keeps the machine at one side of the road and prevents interference with traffic.

The Wheeling Traveling Rock Crusher





Expressing—in simplified mechanical perfection-the modern trend in Highway Construction & Maintenance

Good Roads MACHINERY

Announces the latest addition to its line of motorized graders—

THE "AUTOGRADER"

A self-contained motor grader-powered with "Red Seal" Continental Motor—as easily operated as a motor truck.

Wheelbase	13′ 0″
Length, total	17′ 0″
Width, total	5′ 1″
Height, total	7′ 4″
Tread, front	30″
Tread, rear	47″

Weight

Steel Wheels..5200 lbs.
Rubber Tires..5600 lbs.
Crawler treads can be furnished

Speeds
(Wheeled Graders)

High	8 m.p.h.
Second	4½ "
Low	2½ "
Reverse	2 "
Blade length (Standard)	7′ 6″

With scarifiers when desired

Self-Starter—and many important features

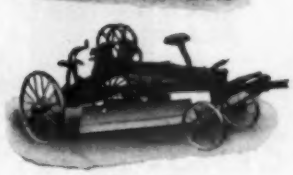
Bulletin KAG

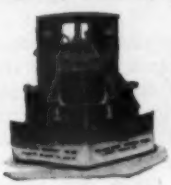
THE GOOD ROADS MACHINERY COMPANY, Inc.

KENNETT SQUARE, PA.

Philadelphia — Watertown, Mass. — New York — Chicago — Pittsburgh — Los Angeles

Distributors in principal Western Cities





The Good Roads Champion Motor Truck Asphalt and Tar Distributor

Distributors for Tar and Asphalt

A LINE of bituminous distributors for use in the application of tars and asphalts in highway construction and maintenance is manufactured by the Good Roads Machinery Co., Kennett Square, Pa. These Champion distributors are built in six models, divided into two types. Type PT obtains power for operating the distributing mechanism direct from a power take-off connected to the truck gears on which the distributor is mounted. In Type PU the power is developed by an independent power unit situated on the frame supporting the distributor, but at the front end out of the operator's way and safely removed from any contact with the burners.

The construction of the Champion distributor is strong and sturdy throughout. The saddles which hold the tank are of forged steel, 5/8-inch thick with a 5-inch face, rolled to the proper radius to fit the tank. They also serve as the base to which the drive shaft bearings are attached. The tank, which on all models is built of locomotive fire-box steel in two complete sections or rings, and rivet-welded throughout, is rigidly bolted to the underframe at the rear end only, being firmly held down on the saddles at other points by anchor straps and thus allowing for the expansion and construction of the tank in its saddles. A heavy vertical baffle plate of tank steel is built into the shell midway between the heads. This baffle is cut away at the top and bottom to allow the material to pass but prevents the contents surging from one end of the tank to the other when the truck is in motion.

The heating system is of the flue type, embodying the marine boiler principle of the internal fire-box, the large return flues at the bottom functioning in a similar way. The fuel oil tank holding 30 gallons has the capacity to keep both burners going constantly for ten hours. The oil is delivered to the burners under pressure generated in the feeding lines and pressure chamber after passing the fuel oil feed pump. The two burners are Aeroil, of the smokeless, non-carbonizing torch type, which are so arranged that they may be removed without disturbing the general piping system.

Two methods of loading the distributor are provided. Should the bottom level of the tank car or storage tank containing the material be slightly higher than the dome on the distributor tank, the loading may be accomplished by gravity through the manhole in the dome, which is provided with an interior strain through which the material passes. Where the tank or other container is situated too low for gravity filling, the suction method must be used.

The distributing system is very simple with fittings reduced to a minimum. Couplings are of the flanged type, of forged steel and packed with asbestos, with all threaded joints electrically-welded to the forged flanged couplings. All passage of materials throughout the system is on a vertical plane. Incorporated in the distributing piping is a relief and control valve which keeps the pump and distributor lines free and clear. This valve acts as a by-pass whenever distribution is stopped at the manifolds, and for excess material returned to the tank when the patching hose is in use, or one side only of the manifold lines are in operation.

For distribution of material to the road, the distributor has two 4-foot standard independent manifold bars or sections, each section being equipped with ten nozzles. These manifolds are of an alloy of aluminum, which is light in weight but strong and durable. They are so designed that the material feeds freely and equally to all nozzles. Additional manifold extensions can be supplied at the option of the purchaser to meet his requirements.

The Type PT obtains the power necessary for operating the pump mechanism direct from the lower take-off shaft of the truck chassis upon which the distributor is mounted. The Type PU has an independent power unit, consisting of a 4-cylinder, 20-horsepower LeRoi gasoline engine complete with a right angle drive, with gearing and clutch arrangement fully enclosed and running in an oil bath. This engine is of the light weight heavy duty type designed for dependable service in heavy construction equipment.

A Handy Heating Torch

AN adjustable and handy heating torch which is suited to many kinds of jobs in the construction industry and which speeds up work is manufactured by the G. H. Williams Co., 609 Haybarger Lane, Erie, Pa. This torch, known as the Universal, is made in ½-gallon and 1-gallon sizes.

The design of this Universal torch concentrates an intense heat on the spot to be worked, and the adjustable nozzle with a full 180 degrees swing and a 14-inch flame makes it possible to work in any position.

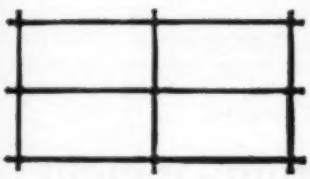
The generator which is ¼-inch special alloy bronze pipe coil insures a steady flow of correctly aerated gas to the needle valve. The nozzle itself has three oxygen intakes to secure the correct mixture.

The New Williams Universal Joint Heating Torch

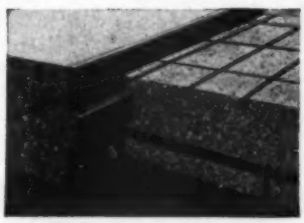
The reservoir of the torch is of heavy seamless steel tubing, with the head and base shrunk in, riveted and brazed. The patented swivel head is so constructed that the valve seats accurately at all times, without grinding, and prevents leakage. The valve is also held in place by a heavy steel spring which keeps it in place in any working position. All unions and connections at the top are of special alloy bronze.

TRUSCON

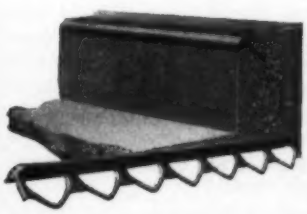
Reinforced Highways Withstand *the* Heavy Pound of MODERN TRAFFIC



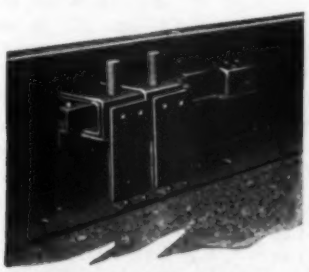
Truscon Welded Steel Fabric—accurately made and economical to handle; furnished in flat sheets or rolls.



Truscon Dowel Contraction Joint—interlocks adjoining slabs, preventing rise of one above the other.



Truscon Curb Bars—reinforce the concrete against shocks and protect the curb from abrasion.



Truscon Steel Road Forms—Rigid, durable and accurate; insure rapid and economical road construction.

Truscon Rib Bars — with substantial ribs to positively grip the concrete. Furnished in all sizes.

Roads and streets must be strengthened to carry the heavier loads of constantly growing traffic. The modern concrete road, reinforced with Truscon Welded Fabric and protected with Truscon Contraction Joints, is the right answer to the problems. The reinforcement provides the added strength, the joints make a definite plane for expansion and contraction. Accurate and rapid construction of the road is promoted by Truscon Steel Road Forms.

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HIGHWAY DIVISION
YOUNGSTOWN, OHIO

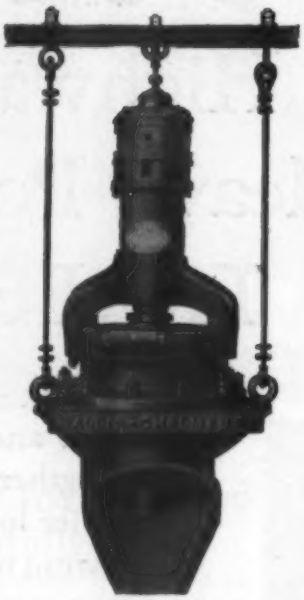
Warehouses and Offices in Principal Cities

THE SECRET OF PERFORMANCE

TRUSCON PRODUCTS FOR REINFORCING ROADS AND PAVEMENTS

A Crusher That Needs No Foundation

THE new Allis-Chalmers Style B Newhouse crusher which is the result of over 7 years work and study, was exhibited for the first time at the 1929 Road Show in Cleveland by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Modern requirements demand low crushing costs which are governed by the ability of the crushing equipment to produce high capacities per crushing unit. This crusher with its large receiving opening, short, rigid main shaft and rapid crushing stroke which is said to be about three times as speedy as older crushers, meets these requirements.



The New Allis-Chalmers Style B Newhouse Crusher

The crusher is supported by three cable suspensions, eliminating foundations. The motor and crusher unit are direct connected. The drive shaft operates through a hollow bored main shaft, eliminating all gears and pinions. The crusher has the same number of gyrations as the speed of the motor.

The crusher is lubricated by an external motor-driven centrifugal pump with oil filter and cooler. The crusher is of heavy construction to meet the most severe crushing conditions. The concaves are reversible end for end. This machine is made in three sites with 7, 10 and 14-inch openings.

Full-Revolving Gas Shovel

A VERSATILE, speedy, full-revolving and easily moved gas shovel is the Model CF, manufactured by the Universal Power Shovel Co., 15841 Second Blvd., Detroit, Mich. This shovel has a capacity of ⅜-cubic yard and is quickly converted to crane, clamshell, dragline and trench hoe without removing the boom, which is standard for all units.

The driving and operating mechanism is very compact, simple and rugged in design. Both the drive shaft and dog clutches are particularly heavy. The operating clutches are well out of the way of the materials that crowd beneath the shovel. The construction is such that the crawler tracks may be operated in any direction, regardless of the position of the table. The gears are machine cut of special steel and double heat treated. The shafts for swing, hoist and crowd clutches are dead and the mechanism revolves around them. All continuously running mechanism above the table is equipped with friction reducing ball bearings.

A special cradle mounting acts as a cushion between the boom and the table, making it impossible to injure the boom even though operating against hard materials. Heavy lateral springs absorb the shock before it reaches the table from the boom and they likewise cushion the boom from shocks developed by a sudden movement of the table. A power boom hoist is standard equipment on all machines. It is self-locking in any position and easily controlled by a single lever. The control lever is so located that the operator can raise and lower the boom without leaving his seat. Simple adjustment, 8 bolts and a single lock nut, provides any desired boom length from 17 to 30 feet in length.

Model CF is powered by a Model-V Waukesha engine with a Ricardo head. It is a 4-cylinder engine, with 4-inch bore and 5-inch stroke, developing 42 horsepower at 1,000 r.p.m. It has full pressure lubrication to the main and connecting bearings, camshaft and idler bearings. An Eisemann magneto and an oil screen are standard equipment.

The New Model CF Universal Power Shovel, a Full Revolving ⅜-Yard Shovel

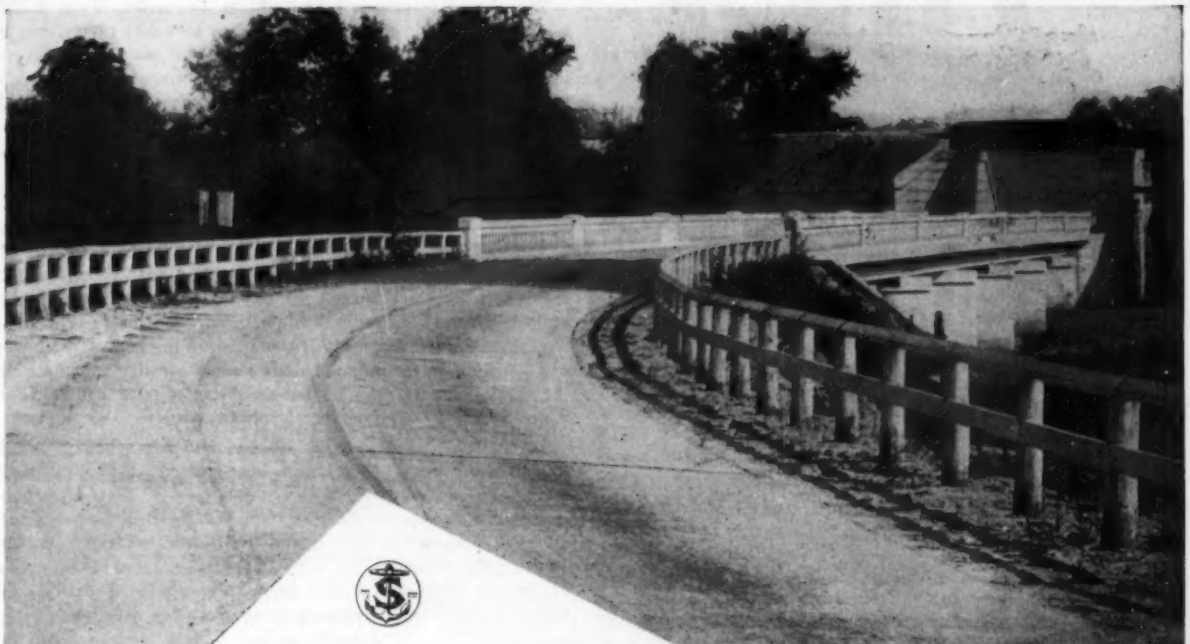
A New Medium-Weight Motor Roller

A MOTOR roller made in 5, 6 and 7-ton sizes under the name Austin Cadet, has been announced by the Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill. In external appearance this new roller is almost an exact duplicate of the 10-ton Autocrat of the same manufacture. The Cadet has the same full-height side-frame plate, lines which afford the operator an unobstructed view of his work and the same grouping of controls close to the operator's position on the platform. The side frame plates of the Cadet are of the same height from front to rear and the two easily removable top housings are made of such heavy material as to retain their shape.

Pup-sized rollers are frequently used between the forms on concrete roads and in many other places where there is none too much room. The Cadet's wheelbase is only 8 feet, 11¾-inches. The Cadet is made in 5, 6 and 7-ton sizes, all of which can be fitted with a front planing blade with its controlling runners as used on the Austin Pup and Bull-Pup, as well as with a penumatic scarifier attachment operating by compressed air.

A heavy duty, 4 ¼-inch 4-cylinder Buda motor provides ample power, not only for rolling, but also for levelling rough subgrades and other surfaces, and scarifying up to the capacity of the machine. The motor can be cranked from either side. A large capacity single clutch of the multiple disc type operated by the conventional foot treadle is placed between the motor and the special three-speed transmission. Since rollers are operated backwards just as much as forward, the Cadet transmission provides the same three traveling speeds both forward and reverse.

Back of the transmission and driven therefrom is the bevel gear set which transmits the forward and reverse motion, this motion being made selective by shifting a sliding jaw clutch, operated by a hand lever from the platform. The spur drive pinion which is a part of this bevel gear set transmits the power to the differential



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Solvay Calcium Chloride curing assures the strength which makes *better* concrete roads. Cured by either the integral or the surface method, these roads require only about half the usual delay before opening to traffic.

Both curing methods eliminate the need for constant sprinkling and inspection and do away with the expense of the final clean-up required by the old cover methods of curing.

Valuable practical information is contained in the booklet, "Curing Concrete Roads with Solvay Calcium Chloride." Write today for your copy.

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Calcium Chloride

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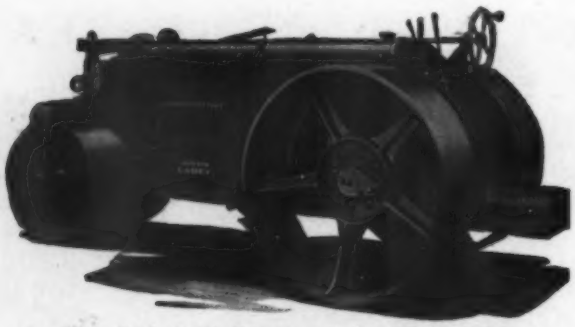


The New Austin-Western Cadet Road Roller

and thence by spur gearing to the gear wheels. The differential action can be locked, if desired, by the use of lock pins in both rear wheel hubs. All gears are enclosed and run in oil.

Both front and rear rolls are extra large in diameter and have no tendency to crowd soft materials. The ground clearance of the machine is ample, yet the center of gravity of the machine is low.

Steering is by a worm, operated by double gears from the hand wheel shaft and in turn operating the worm gear segment which is secured to the front fork king pin. A powerful foot brake is directly connected to the differential. This brake is always operative regardless of whether or not the roller is in gear and can be locked in position.

A New ½-Yard Full Revolving Shovel

A NEW Insley excavator, which can be used as a shovel, ditcher, skimmer scoop, crane or dragline, is now being manufactured as Type R by the Insley Manufacturing Co., Indianapolis, Ind. This new shovel is similar to the Insley Type C, with two added features. Type R is full revolving and has additional weight.

The car body is a steel casting and is machined on top to insure a perfect bearing for the rack and track which is bolted to it. Heavy structural H-beams form axles connecting the machine to the crawlers, and are bolted to the underside. The machinery base is also made of cast steel, carrying all hoisting and swinging mechanism as well as the track rollers. The revolving frame which carries the counterweight is built up of structural steel and is bolted to the machinery base. The A-frame, carrying topping line sheaves, is made up of tubular members in front, and heavy angles in the rear. It is centered over the center of the machine in such a way that cross bracing does not interfere with the action of the shovel dipper and is therefore well braced against side strain.

The New Insley Type R Full-Revolving Shovel

The shovel is powered by a Buda 4-cylinder, Type KBH 4-inch x 5¼-inch engine. It operates at 1,400 r.p.m., has a counterbalanced crankshaft and an enclosed governor. Accessory equipment includes a magneto with impulse starter, which facilitites starting in cold weather, and the carburetor fitted with an air cleaner. A single dry plate clutch, and a transmission having two forward speeds and one reverse are connected to the engine.

Among the features of the Insley shovel is the cable crowd, by means of which all the movements of the shovel are accomplished with cables, thereby dispensing with a number of operating parts. The shovel boom is of the open type, through the center of which the dipper passes, and it is made of two 10-inch channels heavily reinforced on the top and bottom. The shipper shaft assembly is mounted on the top of the boom and consists of the shipper shaft and two rollers upon which the dipper handle rolls, and a cast steel dipper handle yoke which serves as a guide for the dipper handle.

The bucket has a ½-yard capacity and has a heavy forged steel cutting edge, carrying 4 heat-treated cast alloy steel teeth. The shovel has a dumping radius of 18 feet, a possible dumping clearance of 12 feet 6 inches under the open door, and will excavate 2 feet below the bottom of the crawlers. It will make a cut 30 feet wide at grade level and 40 feet wide at the top of a cut 10 feet deep. The shovel is easily converted into a ditcher, skimmer scoop, crane or dragline.

The New Industrial-Brownhoist Topping Pony Ditcher

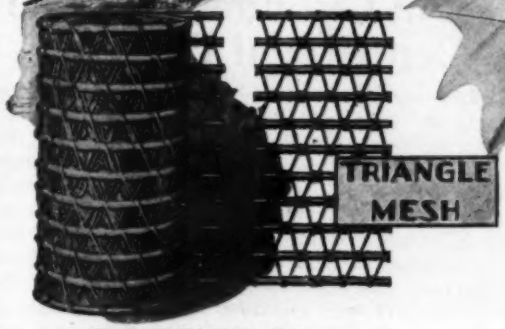
A Light Weight Traction Ditching Machine

THE Topping Pony-Ditcher is built by the Industrial Brownhoist Corp., Cleveland, Ohio, to fill the need for a light weight, crawler-mounted trench digger that is reasonably priced and will turn out a good day's work. This ditcher is built of the best materials throughout and is powered by model 20 McCormick-Deering industrial tractor which provides ample power for hard, continuous digging and traveling. The Pony-Ditcher is intended for trenching work where hand shoveling is too slow and the use of a bigger machine too costly. Its digging capacities range from 13 inches to 30 inches in width with a maximum depth of 7½ feet.

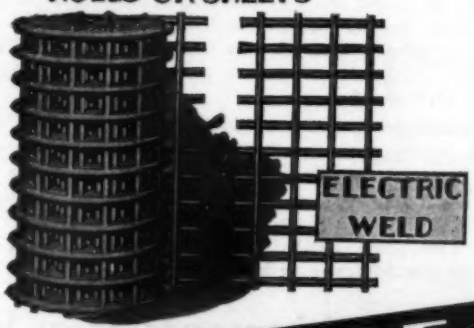
The ditcher is mounted on crawlers which are self-cleaning, easy to steer and are provided with long wide belts for low ground pressure. The crawler has an overall length of 126 inches and is equipped with a modified one-shot lubricating system with high pressure fittings. The crawler shoes are 13 inches wide, have a 10-inch pitch and are of special steel.

WHY SAVE PENNIES IN BUILDING And Spend Dollars In Repairing?

Make it a PERMANENT INVESTMENT



FURNISHED IN ROLLS OR SHEETS



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WIRE FABRIC
The Steel Backbone for Concrete

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Nine speeds forward and one reverse are available on the Pony-Ditcher and thus provide traveling and digging speeds to meet all conditions, the speeds ranging from 70 feet to 3¼ miles an hour. All shafts in the transmission are mounted in ball bearings and all gears, shafts and bearings run in oil in an oil tight case.

The excavator buckets are of the self-cleaning type and can be furnished with cutting widths ranging from 13 to 30 inches. They are mounted on a non-buckling chain on which the tension is maintained by an automatic chain tension device.

The excavator cross conveyor, for depositing dirt at the side of the ditch, is reversible by means of a shift lever and automatically levels itself regardless of the position of the ditcher boom. The excavated material can be deposited on either side of the ditch as the conveyor can be shifted easily from one side to the other by a hand wheel.

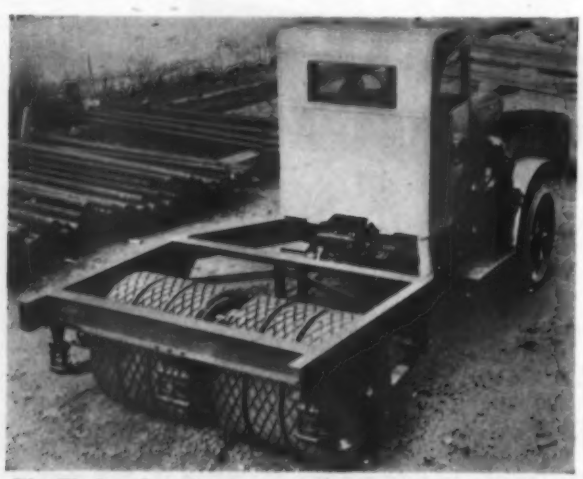
The excavator boom is close coupled to the chassis, giving a low center of gravity. The boom and all operating mechanism for the excavator unit is rigidly supported by electric steel casting. The boom hoist is self-locking and is provided with an automatic knockout for its friction clutch, for safety.

A Heavy Duty Truck That Rolls Out the Ruts

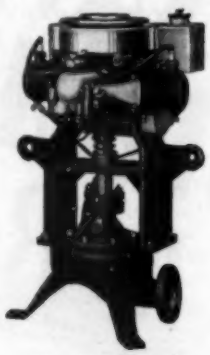
HEAVY duty trucks on wet ground are bound to create ruts. Many contractors have had this experience beginning in the spring and even through mid-summer where there have been continuous rains or where a spring has weakened the subgrade of a road by keeping it continuously wet. The Cleveland Crane & Engineering Co., Motor Truck Div., Wickliffe, Ohio, has developed a novel truck which has overcome this obstacle. Cant-Rut Roller trucks have six rear wheels instead of two. Each wheel on this new truck is equipped with a 12 x 36-inch tire. This extra bearing surface permits trucks so equipped to travel over ground that would be impassable for ordinary trucks. Each wheel has Timken bearings.

The capacity of the Cant-Rut Roller truck is 4 yards. The wheelbase 136 inches, the length overall 210 inches and the width overall 87 inches. The tread width of the rear is 74 inches and of the front 56 inches. The turning radius is 26 feet 8 inches. The drive is straight line with the differential on top of the axle and the final drive is internal gear and pinion. The truck is equipped with service brakes of the internal expanding hand type operated by a foot pedal on the rear wheels and the emergency brake on the drive shaft.

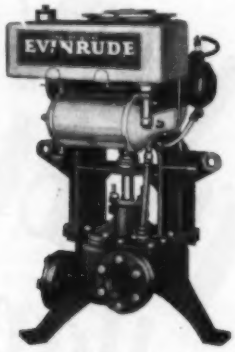
The truck is equipped with both a front and rear gate. The front gate has a 7/16-inch Goodyear heavy tread belt attached to it and instead of raising the body of the truck to dump it, a drum, turned by a cable from the power take off, winds up the belt and brings the front gate to the back, dumping the entire load as from a conveyor.



The Worley Cant-Rut Rear Axle Assembly of Six Wheels



Front View of the Evinrude Pump



Rear View of the Evinrude Twin-Cylinder Pump

A Twin Cylinder Portable Centrifugal Pump

SEVERAL years ago a portable centrifugal pump was placed on the market by the Evinrude Motor Co., Pump Division, Milwaukee, Wis. The success of this pump has led to the development of the Twin Evinrude centrifugal powered with Evinrude 6-horsepower Fleetwin motor. The Twin engine which powers this new Evinrude pumping unit runs smoothly hour after hour. Great precision in machining and the careful weighing and balancing of moving parts has practically eliminated vibration. The new pump has very large capacities, although the weight of the outfit is decreased by 10 pounds and the overall size is decreased 11 per cent. The capacity is 132 per cent greater at a head of 5 feet and 149 per cent greater at a head of 30 feet than the old pump. The limit of height of the old pump was 40 feet, while the new one reaches 50 feet. This pump will deliver 15,240 gallons per hour at 2,150 r.p.m. against a head of 5 feet.

The auto-type spray-proof carburetor with which this pump is equipped enables it to operate efficiently on any grade of automobile gasoline. The fuel cost is low as the pump runs a full hour on one gallon of gasoline. It starts easily because the magneto gives a fat spark at very low speed. The pump weighs 105 pounds and is fitted for bolting to a wood frame or hanging by a rope.

L. C. L. Shipments May Be Made in Multi-Wall Paper Bags

THE Consolidated Freight Classification Committee, according to the Bates Valve Bag Corp., 35 East Wacker Drive, Chicago, Ill., has granted past applications and published, effective February 1, 1929, a supplement which will allow the shipment of cement, lime, plaster, powdered limestone, mortar colors, foundry facings and numerous other commodities to be shipped in less than carload quantities in Multi-Wall paper bags. In some of these instances the carload, as well as the L.C.L., shipment is also new and applies.

More detailed information can be ascertained by reference to Supplement 18 to Consolidated Freight Classification No. 5, ICC-49.

New Highways for Old—*Quick!*

Route 16, near Tullahoma, Tenn., Tarvia "Re-Tread"

THE discomforts, inconvenience and losses caused by worn-out roads are always expensive and wasteful, compared with what it costs to transform these old roads into smooth, pleasant-riding, non-skid highways with Tarvia "Re-Tread."

As public acquaintance with Tarvia "Re-Tread" grows, it is bound to occupy an important place in the planning and thinking of every highway official. Acquaint yourself—and your community—with this material and method. Here is a means of highway rejuvenation that is simplicity itself. Costs are impressively low—and there need be no interruption to traffic.

The Tarvia man will be glad to discuss details with you. Write, wire or phone our nearest office.

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Tarvia "RE-TREAD"

TRADE MARK REG. U. S. PAT. OFF.

BULLDOZING 56,000 YARDS OF EXCAVATION ON THE EDGEBROOK GOLF COURSE OWNED BY THE FOREST PRESERVE DISTRICT, COOK COUNTY, ILL.

This Cletrac 40 is owned by the Barber Paving Company and is equipped with an Essex hydraulic bulldozer made by the Essex Engine and Machine Corp., Belleville, N. J. It is able to keep ahead of the job and can dispose of four to five truck loads at one push. The low spots in the golf course were filled in without interfering with the play even though it is said that this course is one of the most used in the country

A Creeper Dump Wagon for Use with Tractor

A CREEPER dump wagon of unusual design with capacities ranging from 3 to 10 yards is manufactured by the Biehl Iron Works, Inc., Reading, Pa. These wagons have exceptionally heavy, all-steel construction throughout and are mounted on heavy duty 15-ton capacity creeper wheels. They are wagons designed to use the full power of crawler tractors in moving dirt and operate economically behind a tractor of this type.

The front axle of the Biehl creeper dump wagon is made of high quality chrome nickel steel protected by heavy electric steel casting and is connected with the front end of the wagon with an oversize king pin sufficiently strong to stand up under the hard use this wagon is subject to. The front wheels on the 8- and 10-yard capacity wagons are double disc steel wheels equipped with heavy electric steel hub casting and fitted with Timken tapered roller bearings, having the ncessary dust collars and cap.

The creeper wheels are track-laying-type equipment, built to travel over hills and hollows and through mud and mire without digging in. All material used in these creeper wheels is of high quality, specially heat treated to secure the ultimate strength. The wheels are very flexible, non-friction and non-clogging, with the fewest possible wearing parts. Thorough greasing for the wheel once a month is sufficient to guarantee ample lubrication. The wheels are made in 4 sizes, 4-, 6-, 10- and 15-ton-capacities.

Standard Specifications for Construction Completed

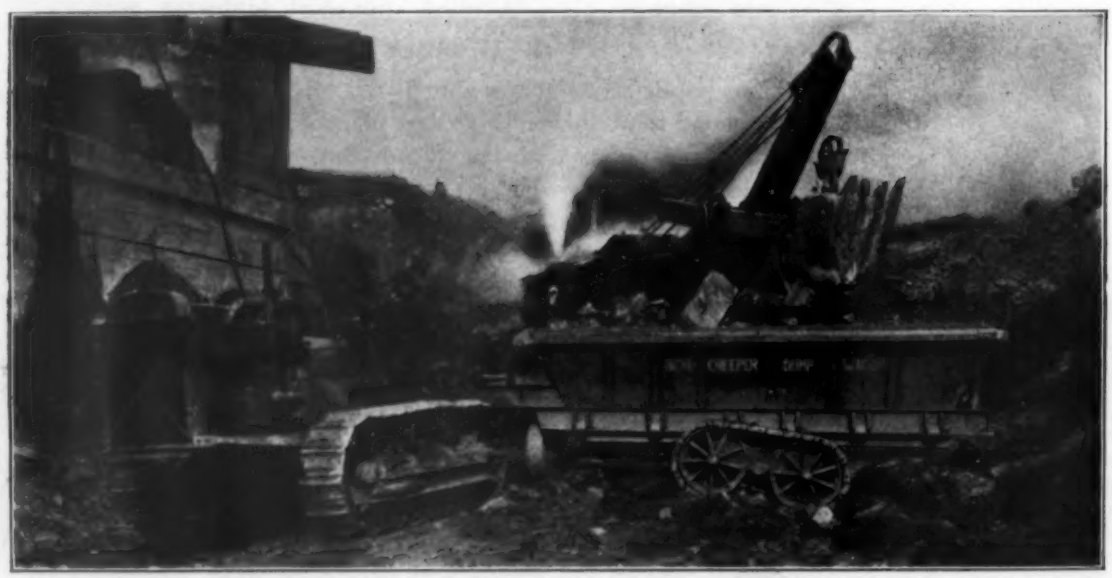
THE New York Building Congress through its Committee on Standards has recently completed standard specifications for the general construction trades in the building industry and will soon make the specifications available to architects, builders, owners, manufacturers of building supplies and others. The standard specifications have been approved by the trades for which they were prepared.

Students of production costs have for many years recognized that appreciable economies would ensue if manufacturers could be persuaded to confine their products within the limits of acceptable standards. The United States Department of Commerce through the Bureau of Standards and special committees studying elimination of waste by means of simplified practice have done a great deal toward establishing such standards for many products entering into building construction.

The New York Building Congress conceived the idea that if in a like manner acceptable standards could be established for materials and workmanship entering into general building construction similar economies would result and much of the uncertainty in estimating be eliminated. It was generally agreed that such standards could best be established through specifications.

The preparation of specifications was at first assigned to various sub-committees but later it was decided to centralize the work and accordingly W. A. Payne, Vice-President of C. T. Wills, Inc., was appointed chairman of the committee and H. R. Dowswell of the office of Shreve & Lamb, Architects, was elected as editor.

All specifications were sent to the various trade divisions for suggestions and approval and then were put into actual practice in order to test their workability and practical value.



A Biehl Creeper Dump Wagon Operating in Close Quarters in Steam Shovel Work

The Spending Public
kept on spending . . . .

with the Armco Jacking Method *the road was never closed!*

IT looked to us like a very difficult job. We had to provide a new culvert under the main road into a nearby town. The usual open trench and detour would seriously cut business for the local merchants in favor of another city — the situation was "ticklish" to say the least. ¶Thanks to the Armco Jacking Method the culvert is now in place without an hour's loss of the use of the road . . . "the spending public kept on spending." ¶It will pay anyone who needs an additional opening under an existing road to investigate the Armco Jacking Method. There is no longer any need for expensive open trench and costly detours. The assistance of Armco engineers is available to you on every Armco culvert job. They have valuable data gathered from many years of field experience, not obtainable from any other source.

Armco culverts and drains are manufactured from the Armco Ingot Iron of the American Rolling Mill Company and always bear its brand

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, Ohio

ARMCO CULVERTS

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A Lima-101 Rigged as a Drag Shovel

A New Shovel from Digging Teeth to Crawlers

A BRAND new shovel with wider working ranges, greater speed and more power and a patented single line hoist, has been developed by the Ohio Power Shovel Co., Lima, Ohio, in the new Lima-101 shovel which is completely equipped throughout with Timken tapered roller bearings. Among the outstanding features of this machine claimed by its manufacturers are its independent differential crowd which responds instantly to the slightest motion of the crowding lever, a single line hoist with a pull of 30,000 pounds at a hoist speed of 100 feet in one minute, all main machinery bearings only 24 inches from the floor, giving a low center of gravity essential for heavy duty digging, and all main shafts on which are mounted sliding members are splined for accuracy in fit and elimination of vibration due to wear and backlash. It has a 73-inch roller path, insuring stability of the upper deck in heavy digging and relieving strain on the center pin. Ninety-nine per cent of all the castings are specially heat-treated alloy steel. It has an outside type clutch and the brake bands are 5¼ inches wide and all are interchangeable. All shafts are oversize and of chrome nickel steel, ground to size. The presser steel heavy duty boom eliminates 50 per cent of the bolts and rivets required in ordinary types and requires no outriggers, truss rods, turnbuckles nor sway braces. The dipper handle is of pressed steel construction to eliminate bolt and rivet troubles and to withstand the strains and stresses imposed by strenuous service. Only three levers are needed to control all motion just as with steam.

On the 1¼-yard Lima-101 shovel, the boom is 21 feet long and the dipper handle 17 feet long. The normal angle of the boom is 45 to 50 degrees. It is powered with a 92-horsepower engine with 6½ x 7-inch cylinder, magneto, radiator and pump cooling system and an electric self-starter. The Lima-101 is also built as a dragline with 40, 45 or 50 foot boom, as a drag shovel and as a clamshell with 40, 45 or 50 foot boom.

The Lima-101 Full Revolving 1¼-Yard Power Shovel

A Machine for Finishing Highway Shoulders

AFTER a concrete bituminous road is completed, a contractor faces a considerable problem in completing the shoulders. It is an expensive piece of work and one which usually requires considerable man power. The Highway Shoulder Machine Co., Effingham, Ill., has developed a tractor or truck drawn machine which greatly reduces shoulder finishing costs, as it eliminates the use of levels, string and straight edges and reduces the labor required by about 90 per cent.

The highway shoulder machine consists of a structural frame on four wheels which rides on the hard surface of the road and acts as a gage to carry the suspended part, a sloper, and a blade, as shown in the accompanying illustration. The drawbar pull is arranged to be in a direct line with the reaction of the blade,

A Highway Shoulder Building Machine, Showing the Carriage, Blade and Back Sloper

thus eliminating much strain on the carriage and a tendency to push it to the side.

A hand wheel adjusts the back sloper and a lever close at hand adjusts the blade pitch. Another hand wheel is used to steer the front wheel at the carriage and still another takes care of the vertical adjustment of the blade, raising it quickly when it is desired to pull the machine around over the highway to a new position to start work again.

There is practically no side motion to the machine, which weighs about 4,000 pounds. By taking four bolts out, the entire blade can be removed and laid upon the carriage. The maximum width of the carriage proper is only 8 feet while with the blade extended, the width of the machine is 19 feet. This machine is used extensively by contractors in Illinois, Indiana, Wisconsin and Iowa.

The following table, furnished by the Highway Shoulder Machine Co., shows the number of square yards of shoulders on both sides per mile of pavement, and is a handy reference table for contractors to use in preparing their estimates for shoulder construction. Note particularly that this covers the shoulder per mile on both sides of the road.

Width of Shoulder	Square Yards Per Mile	Width of Shoulder	Square Yards Per Mile
1 foot	1,173	7 feet	8,214
2 feet	2,347	8 feet	9,387
3 feet	3,520	9 feet	10,560
4 feet	4,693	10 feet	11,733
5 feet	5,867	11 feet	12,907
6 feet	7,040	12 feet	14,080

Standard Macadam Asphalt Binder "B" on Long Pond Road,
Town of Greece, Monroe County—1925

Standard Asphalt Products

Standard Asphalt Binder A
for surface treatment

Standard Asphalt Binder B
for penetration work

Standard Asphalt Binder C
for the mixing method

Standard Asphalt Joint Fillers
for brick or block pavements

Standard Cold Patch Asphalt
for repairing all types of bituminous road surfaces

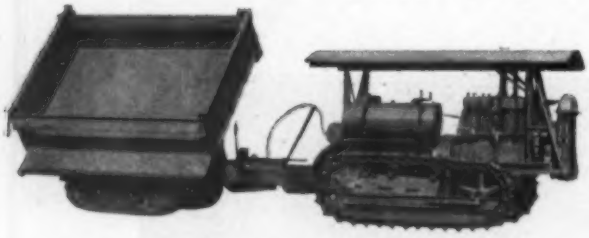
Standard Refined Asphalt
(Socony Brand)
for sheet asphalt paving

Standard Paving Flux,
Bridge Asphalt and
Preserving Oils

Specifications and all other particulars furnished on request

SOCONY
ASPHALTS AND ROAD OILS

STANDARD OIL COMPANY OF NEW YORK, 26 BROADWAY



Athey Trailer Operating as a Side Dump Wagon

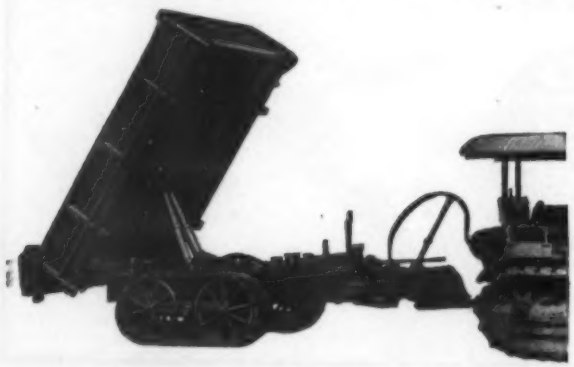
A Three-Way Dump Trailer with Crawler Wheel

WITH the increased use of medium and heavy tractors in the construction field, the units for hauling material have increased in size. One of the latest is the Athey Truss Wheel, a three-way dump trailer made by the Athey Truss Wheel Co., 130 North Wells St., Chicago, Ill. This trailer unit is made in two different sizes, a 4 or 5-yard trailer on a 10-ton chassis for use with a Caterpillar Thirty, or equivalent and a 7 to 8-yard trailer on a 15-ton chassis for a Caterpillar Sixty or equivalent. The dump body on this unit dumps to the right, left or to the rear, the dumping being controlled entirely by the tractor operator. The side and rear gates open and close automatically. Two or more of these trailers set for side dumping or side and rear dumping may be readily handled in a train. They will turn in any cut where a shovel can operate. The bodies and hoists are the improved commercial three-way dump. The side gates down fold and the load is discharged beyond the wheels. The hoist is a direct lift, eliminating complicated lifting mechanisms. The telescoping cylinders are mounted on a steel arched casting operating on double oscillating trunnions at the top and bottom, applying the power under the load at the most advantageous point.

The large capacity of these trailers permits more continuous operation, thus eliminating from 50 to 75 per cent of the loading delays. The trailer dumps over a fill, thus eliminating bulldozing. The body hinges are mounted on the corners, thus assuring safe dumping on uneven ground. The Truss Wheel tracks do their own rolling and uniformly pack the fill. A false bottom is recommended when the equipment is to be used for hauling rock. This consists of a flanged floor plate and hardwood filler bolted in place to the floor of the body.

The inside dimensions of the 7-8-yard body are: length, 129 inches; width, 92 inches, and depth, 28 inches. The dumping position is controlled by the tractor operation. The wide body facilitates the rapid spotting of the dipper during the loading operations.

The Athey Truss Wheel with which these trailers are equipped is a track-laying wheel of special construction adapted for transporting heavy loads over ground that is soft, sandy or deeply covered with rotting vegetation. The 10-ton wheels have 9 square feet and the 15-ton wheels 12 square feet of supporting area, provided by a pair of wide, rigid steel tracks that carry capacity loads wherever animals or tractors can work. The light running qualities of these wheels are due to the combination of track wheels mounted on antifriction bearings and rolling on a rigid steel track.



Athey Truss Wheel Dump Trailer Discharging to the Rear

Single and Double Diaphragm Pumps

THE new Rex single and double diaphragm pumps, the design of which includes the bowl method of changing the diaphragm, enclosed gears running in oil, simplified grease system and up-to-date trailer, are manufactured by the Chain Belt Co., 766 Park Street, Milwaukee, Wis.

Among the features of this Rex pump is the positive suction. It retains its suction even when pumping small quantities of water, thus insuring steady pumping. The lip of the high water spout is raised several inches above the diaphragm.

The Chain Belt Double Diaphragm Pump

When the Rex starts pumping, a positive seal of water, several inches deep, covers the discharge valve completely, thus maintaining the prime.

When desiring to change the diaphragm, all that is necessary is to loosen 4 nuts on the bowl of the pump. This tilts toward the spout side fully exposing the diaphragm which can then be adjusted and centered with ease while in the tilted position.

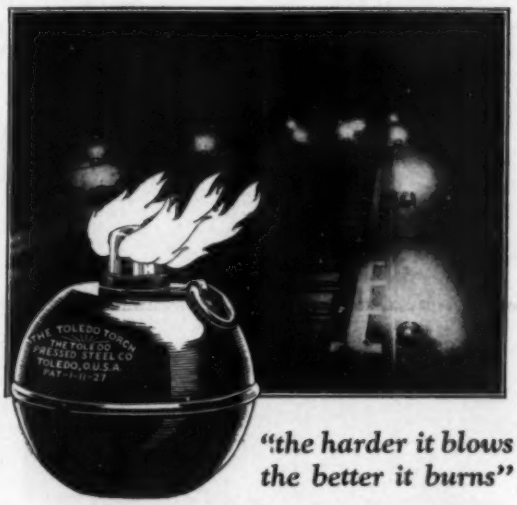
The Rex 4-inch double diaphragm pump has a capacity about double that of the single unit and has a maximum suction lift of 25 feet. It has the same features as the single pump. Both engine and mechanism are continuously and automatically lubricated. All parts are made large and strong. Bearings and wearing parts are bronzed bushed and pins are case-hardened and ground. The suction manifold is built for one hose, but if desired this manifold can be removed and with the addition of an extra flange, two hoses can be used and water taken out of two different places with one pump. This model is mounted on a 4-wheel truck, with large diameter wheels.

These pumps may be powered with either a Stover or a LeRoi engine from 2 to 5 h.p. and can pump as high as 12,000 gallons of water per hour on a low suction lift making them adaptable for a wide range of uses in unwatering excavation, trenches and flooded cellars.

you don't need a watchman

—to prevent theft of safety lights
—to replace broken globes
—to keep globes clear

when you use Toledo Torches



"the harder it blows the better it burns"

THE NEW 'Champion'

takes care of the job alone, at a great saving in operating cost. It is equipped with the wonderful new Economy Burner, that completely solves the problems of excessive oil and wick consumption. No other safety light combines such rugged durability with unfailing performance in all kinds of weather.

Bring your job up-to-date

The public knows and likes the Toledo Torch, because it gets them past the danger without groping or guess work.

It prevents accidents because it actually lights up the job, with a flame the color of all modern caution lights—*yellow.*

Ask your dealer for complete particulars, or write us direct.

THE
Toledo Pressed Steel Co.
TOLEDO, OHIO

BUY BOSS MIXERS and HOISTS DIRECT FROM FACTORY

YOU GET SALESMAN'S & JOBBER'S PROFIT!

SAVE $42 to over $384 ON EACH MACHINE

Every manufacturer is trying to reduce his selling costs. We have found the way and are going to give the difference to our customers in order to increase our sales. We have done away with all our salesmen and jobbers and are now selling direct to users. We have deducted the salesman's and jobber's commission from each machine and the difference is our price to you. This is the most astonishing news in the construction industry and it is certainly paying us as sales are jumping by leaps and bounds. Get the new catalogue with new confidential wholesale prices on each machine. It shows the most popular types and combinations, describing each fully—with new price. The coupon will bring it.

SAME HIGH QUALITY

Regardless of this drastic price cut, the quality of BOSS Mixers and Hoists remains the same. They have always been noted for their heavy duty construction and materials. Under no consideration will we ever sacrifice this reputation. Get the catalogue. Note the specifications and compare the prices. You get the same patented Re-Mixing Action and other exclusive features that have made BOSSES preferred wherever used. Hundreds of BOSS machines have ten, twelve and fifteen years of continuous service behind them and still going strong. For quality of design, materials and construction we defy anyone to find a better built machine than a BOSS. You can now get all this for less.

BOSS 10S NON TILTER "One-Two Bagger" patented mixing action, steel construction, high speed performance with one man control.

Get Our Prices

Send Coupon for New Catalogue With Confidential Wholesale Prices

The new BOSS Catalogue gives complete information on all the BOSS Mixers, Pavers and Hoists along with the new confidential wholesale prices. Even if you do not want to order now, get this new catalogue and keep it on hand for future use. Fill in the coupon and mail today. It will save you money. Though you may have bought direct from a manufacturer before you have never been able to buy at these prices because no salesman's or jobber's commission is figured in. Prices on every machine are greatly reduced. Get the new catalogue with wholesale prices.

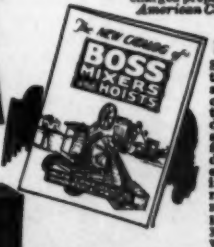
A COMPLETE LINE

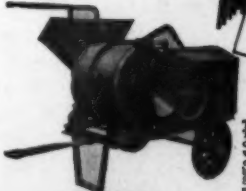
We make over 79 various sizes, combinations and types of BOSS Mixers, Hoists and Pavers. There is a type for every conceivable use. Get the new catalogue first, then decide. Often our customers find that they can use a much lower priced machine after studying this catalogue. There is no need of going elsewhere for a certain machine when it is in the BOSS line. Write for catalogue and confidential wholesale prices; also give us information on kind of work you want the machine for. We can probably be of help to you.

NEW CATALOG—WITH WHOLESALE PRICES TELLS ALL!

1 YEAR GUARANTEE

GUARANTEE—All BOSS equipment is guaranteed for one year against defective materials and inferior workmanship. Any parts proving defective will be replaced free of charge (electrial or engine equipment excepted, as this equipment is guaranteed by the respective engine manufacturers) upon return to us of defective parts, carrier charges prepaid for our inspection.
American Cement Mach. Co., Inc.





THE BOSS 8½S NON TILTER. One half bag drum type trailer mixer with 2 disc wheels, cushion rubber drop batch hopper, 5 HP Stover engine, magneto, steel engine housing.

5 DAYS' FREE TRIAL

So confident are we thatevery BOSS Mixer and Hoist will give complete satisfaction, that we offer you five days' free trial. Order a BOSS. Use it in the field. If within five days you do not find it exactly as represented in every way, send for return instructions and refund of purchase price. This protects you; you can't go wrong on a BOSS. As long as we have sold on this basis, we have never had a customer demand his money. This proves BOSS quality. Every BOSS machine is backed up with an iron clad guarantee. Read it above.

CLIP AND MAIL THIS COUPON NOW!

GET OUR PRICES

CLIP AND MAIL THIS COUPON

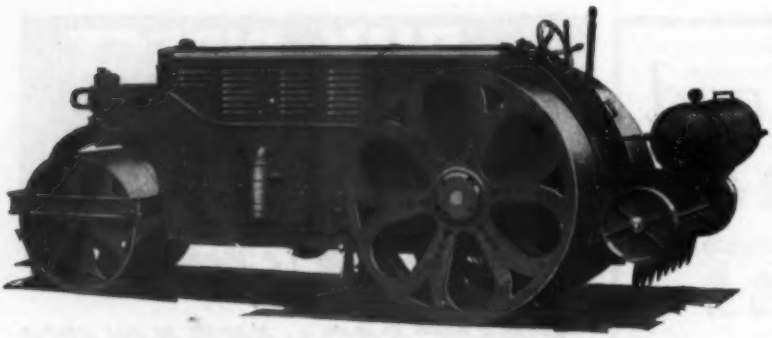
AMERICAN CEMENT MACHINE CO.,
235 S. Fourth St., Keokuk, Iowa.

Send me your new catalogue showing complete line of BOSS Mixers, Pavers and Hoists with confidential wholesale prices.

Name _____

Address _____

Town _____ State _____



A 10-Ton Motor Roller with the New Huber Scarifier

A New Scarifier for a 10-Ton Gasoline Roller

A NEW scarifier has been designed by the Huber Mfg. Co., Marion, Ohio, for the 10-ton Huber gasoline roller. The features of this scarifier are that the cylinder is located underneath the deck of the roller where it is out of the way and the pressure is applied to the scarifier bar through bell arms and levers, to multiply the cylinder pressure as it is transmitted to the tooth bar. The tooth bar is a solid steel casting with gage wheels at the ends to regulate and control the depth of the cut.

The teeth are quickly detachable and can be replaced or reversed in a few moments' time. They are held in place by a spring plunger and it is only necessary to compress the spring to release the teeth. While the tooth bar raises up in the rear of the deck to give a high tooth clearance, the bar is held close to the rear roll, a decided advantage, especially when rough or uneven surfaces are being scarified.

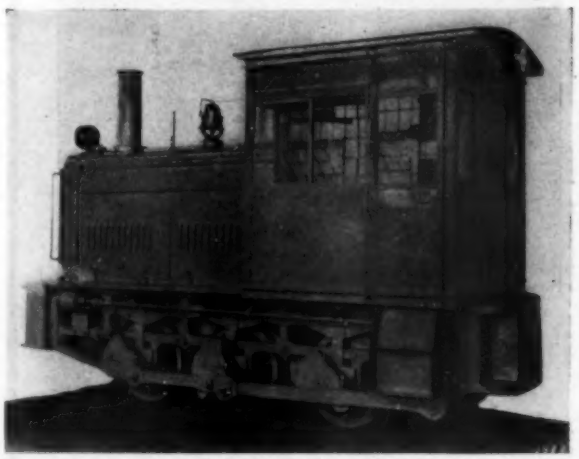
A Medium Weight Heater for Asphalt Tank Cars

THE heating of tank cars has always presented more or less of a problem to municipalities or contractors purchasing asphalt in bulk. The problem is increased or lessened according to the kind of equipment used, the method of transporting the equipment and the necessary water and fuel supply to say nothing of the time required to reduce the material to pumping consistency.

The New Etnyre Asphalt Tank Car Heater

A light weight heating system arranged for easy and speedy transportation has been developed by E. D. Etnyre & Co., Inc., Oregon, Ill. The tank car heater is the invention of J. C. Cleaver of Oregon, Ill., who for a long time has been closely associated with E. D. Etnyre & Co.

When mounted on a two-wheel rubber-tired trailer for transportation behind a truck or automobile, the total weight of the heater is less than 1,200 pounds. It can be set up and hooked up to the tank car by one man in 15 minutes. The heater is of the steam generating type consisting of double boilers and operates on a closed circuit. Heat is supplied by two oil burners of the generating type which are furnished with the heater. It is claimed that in 30 minutes from the time the heater arrives at a tank car, it can be operating with 125 pounds of steam in the coil. The inventor claims that on a recent test 10,000 gallons of 150 penetration asphalt in a tank car equipped with double steam coils was reduced from the solid state to pumping consistency in 7 hours with one of these heaters, using 32 gallons of kerosene and 25 gallons of water in the boilers.



The New Six-Wheel Side Rod Drive Whitcomb Locomotive

A New Six-Wheel Industrial Locomotive

A NEW 20-ton, six-wheel, gear and side rod-drive locomotive for industrial hauling and switching is being manufactured by the George D. Whitcomb Co., Rochelle, Ill. The use of this six-wheel design gives an even distribution of weight over the three wheels and makes possible the use of the locomotive in places where the tracks are not in perfect condition or where they are laid on soft ground.

This Whitcomb locomotive is full gear driven, transmitting the power to the wheels through side rods. It is equipped with standard air brake equipment. It can be used in industrial plants for switching and on railroads for short main line hauls. It is also designed for quarries, construction works, lumber tracts and other places where ground conditions are unfavorable.

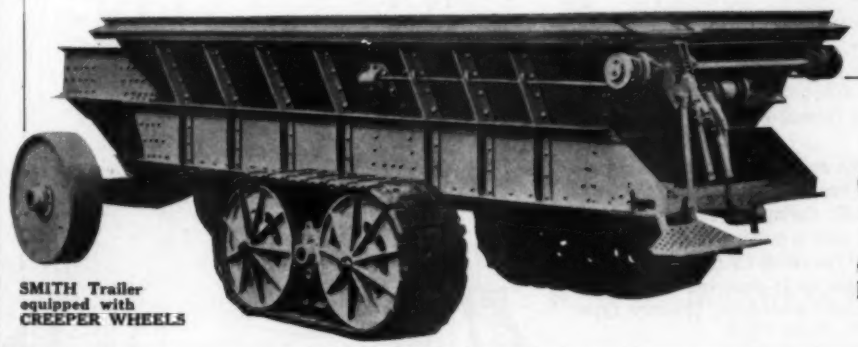
Among the practical articles in the April issue of CONTRACTORS AND ENGINEERS MONTHLY *are one on material handling for the Hudson River Bridge anchorages and an Oklahoma article showing how calcium chloride saved the day when water ran short for curing a concrete road.*

CREEPER WHEELS for ROUGH GOING

Mire, mud, mounds, stumps, roots, hollows, holes—uphill or downhill—it's all the same to CREEPER WHEELS. **They just keep right on going.** No road is needed—they make their own road! After they have been over the same ground a few times, a road appears where none existed before! If you are looking for uninterrupted haulage under all circumstances and greater economy—

"Mount your equipment on CREEPER WHEELS"

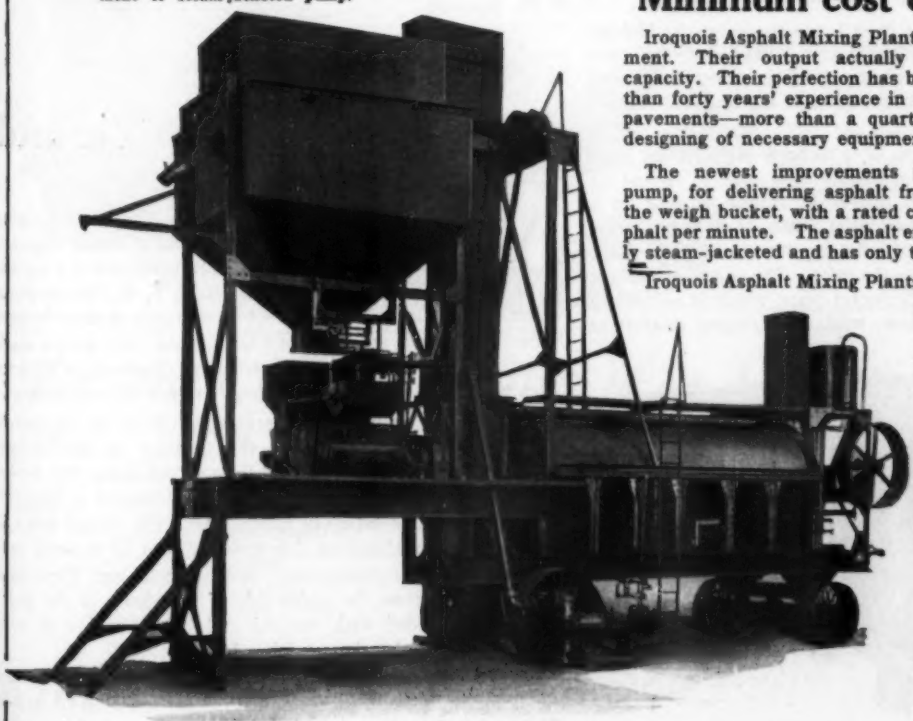
CREEPER WHEELS are manufactured in four sizes of 4-, 6-, 10-, 15-ton capacities. Equipped throughout with roller-bearings. ***Write for illustrated booklet.***



SMITH Trailer equipped with CREEPER WHEELS

The
CREEPER WHEEL COMPANY
602 Colonial Trust Building
Reading, Pa., U. S. A.

Illustration shows the Iroquois Three-Unit Portable Asphalt Mixing Plant, with guaranteed capacity of 1,500 square yards of 2-inch sheet asphalt topping per day. Note arrangement of steam-jacketed pump.



Greatest capacity Fastest mixing
Minimum cost of operation

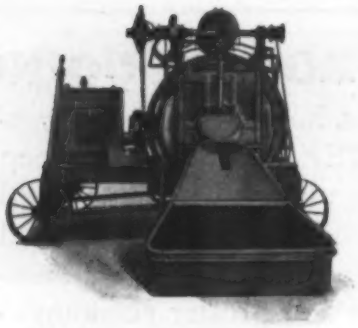
Iroquois Asphalt Mixing Plants fully meet every requirement. Their output actually exceeds the guaranteed capacity. Their perfection has been attained through more than forty years' experience in the construction of asphalt pavements—more than a quarter-century devoted to the designing of necessary equipment.

The newest improvements include a steam-jacketed pump, for delivering asphalt from the melting kettles to the weigh bucket, with a rated capacity of 50 gallons of asphalt per minute. The asphalt end of the pump is completely steam-jacketed and has only three moving parts.

Iroquois Asphalt Mixing Plants are made with guaranteed capacities of 400, 1000, 1500 and 2000 square yards. Portable or stationary; electric or steam driven. Write for full details; also for information about the entire Iroquois Line—driers, rollers, paving tools, and all street-paving and road-building equipment.

Iroquois Sales Department

THE BARBER ASPHALT CO.
Philadelphia
New York Chicago
St. Louis Kansas City
San Francisco Pittsburgh



The New Leach 5-S Side Skip Mixer

A New All-Steel Concrete Mixer

A NEW all-steel concrete mixer, known as the Leach 5-S, is manufactured by the Leach Co., Oshkosh, Wis. This is a fast mixer with a power side skip loader and one man lever control. It has a non-tilting steel drum 45½ inches in diameter. The entire frame, which is of steel, is electrically welded throughout.

Among its many features is the welded splash plate, a feature of all Leach mixers, which prevents any of the concrete from splashing back into the loader during the mixing process. There is no open jack shaft and only 6 moving bearings. The power loader is the direct drive type, with an automatic kick-out and brake and a charging angle of 55 degrees. The water tank is the fully enclosed, automatic measuring, pressure type with a capacity of 11 gallons.

The mixer is powered with either a 5- or 6-h.p. gasoline engine or a 3-h.p. electric motor.

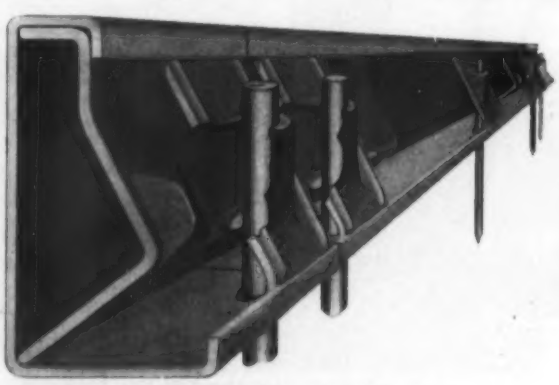
Steel Road Forms

THE 1930 Armor Plate road forms made by the Heltzel Steel Form & Iron Co., Warren, Ohio, while embodying improvements, can be used in connection with Heltzel old type road forms, inasmuch as the standard Heltzel rail has not been changed.

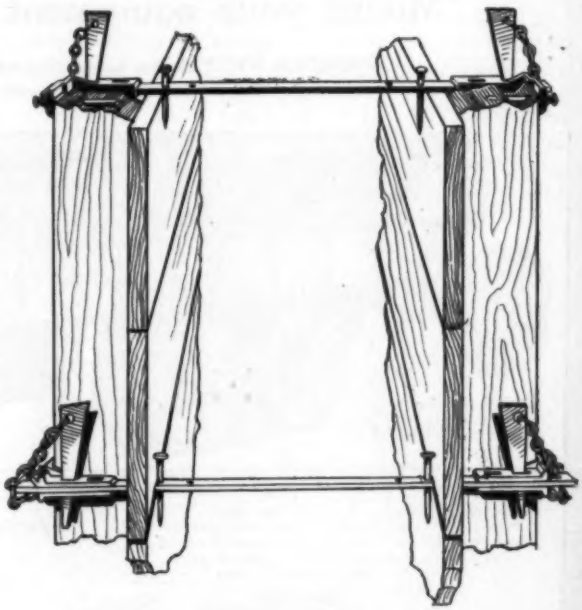
These forms are made up of 3/16-inch high carbon steel rail in 10-foot lengths and in heights of 6, 7, 8, 9, 10 and 12 inches. The 6-inch base is reinforced against bending by a truss flange. The sliding lock joint, made of a ¼-inch steel plate 16 inches long, has a driving lug for releasing the joint wedges which are pressed into the plate. The stake pockets are hot pressed from the ¼-inch pocket plate, which is secured to the rail by 12 inches of electric weld. Hot pressed reinforcing ribs in the stage pockets add extra rigidity to the pockets and to the rail.

The 18-inch to 24-inch by 1-inch diameter steel stakes are located 3 inches from the rail ends where they are most needed. The steel stakes pass through the base of the form, providing extra support. Just as the base is supported by a 1-inch extra flange the 2⅛-inch tread flange is reinforced by an extra turned-over flange, giving added rigidity.

When the sliding joint is driven over, the wedges clamp the stakes in place and the sliding joint is expanded, forcing its top against the tread flange, making a smooth, rigid joint, yet one which can be adjustable for curves. It is possible to negotiate curves having a radius of 75 feet with a 10 per cent rise or fall in grade with this lock.



The 1930 *Heltzel Road Forms*



The M & M Strip Ties and Clamps

An Adjustable Strip Tie and Spacer

ADJUSTABLE strip ties and spacers, designed to give an efficient tie for clamping concrete forms together and holding the forms apart, are manufactured by the M & M Wire Clamp Co., 2 Fifth Street, S. E., Minneapolis, Minn. These ties are made of 14 gage flat band iron ½-inch wide. The wedges are cut mild steel and the castings are made of certified malleable iron. The strips are standardized in three sizes which will meet the usual requirements of contractors.

The M & M strip ties are very easily placed on the forms. The clamp unit is fastened to the studding by driving one 8d nail. The strip unit is slipped through the clamp, the wedge inserted and driven up with one or two blows of a hammer, and the form is completely clamped up. The round holes in the strip are positioned so that a 6d nail can be inserted as a spacer to hold the forms apart on each inch size. There is a small space left on the under side of the clamp at the point where it is nailed with one 8d nail, which makes it very easy to remove the clamp with a hammer.

The standard sizes of the ties are tie A for walls 8-12 inches, tie B for walls 12-16 inches and tie C for walls 16-20 inches. If heavier ties are required, heavier strips may be secured which can be used with the M & M tie rod clamp.

How do YOU move earth?

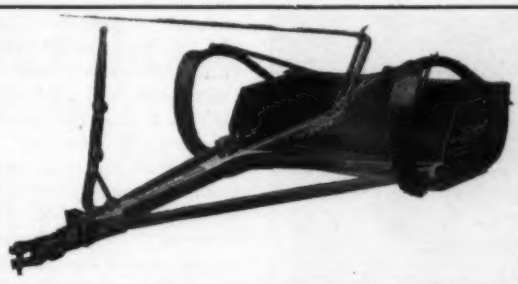
Have you a one-man scraper?

Will it load, dump, spread and level?

Are all of these operations easily controlled from the driver's seat? What about the upkeep cost? Is it low?

If you can't answer "YES" to all of these questions, you need the SCHAEFER Automatic One-Man Tractor Scraper.

Schaefer CLEVELAND



The Gustav Schaefer Company

Established 1880

4180 LORAIN AVE. CLEVELAND, OHIO

Schaefer CLEVELAND

Preferred by thousands of earth-movers

Leading the market since 1921, the SCHAEFER One-Man Tractor Scraper is preferred by thousands of earth-movers. It is a practical tool of proven worth. Used the world over.

Furnished with or without Auxiliary Back-up Control. Four stock sizes: Scraper width 4, 5, 6 and 7 feet.

Write for our circulars

No. 15 Saw Rig

C H & E

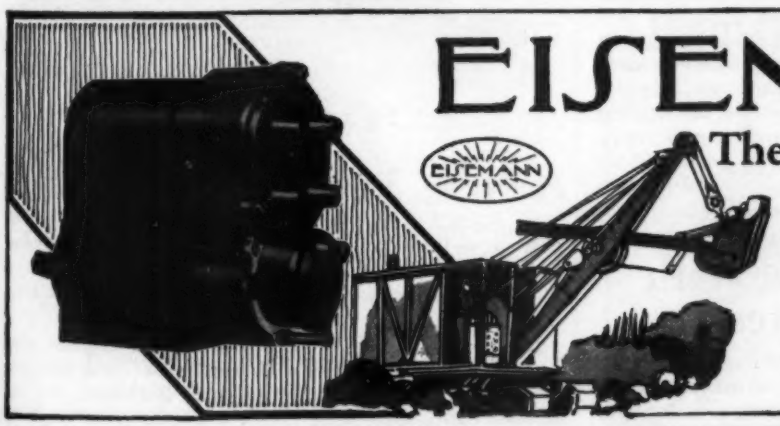
PORTABLE SAW RIGS....(7 Sizes)
TRIPLEX PUMPS .....(4 Sizes)
CENTRIFUGAL PUMPS ...(10 Sizes)
TRENCH PUMPS .....(3 Sizes)
LIFT & FORCE PUMPS....(4 Sizes)
PISTON PUMPS .....(3 Sizes)
HOISTS .....(9 Sizes)
MORTAR MIXERS.....(2 Sizes)
MATERIAL ELEVATORS..(3 Sizes)

Write for Bulletin

C. H. & E. MANUFACTURING CO., INC.

Milwaukee, Wis.

EISEMANN



The Foremost Magneto

for Construction Equipment

The overwhelming choice of the builders of high quality equipment. Favored by contractors everywhere.

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165 Broadway - New York

For More than a Quarter of a Century Lakewood has Served the Construction Industry

Paving Equipment

FINISHING MACHINES
SUBGRADERS
CARR ROAD FORMS
GRADEROOTERS
FLOATBRIDGES
ALUMINUM STRAIGHT EDGES
BATCH BOX CARS
STEEL BATCH BOXES

Construction Equipment

CONCRETE MIXERS
STEEL TOWERS
CHUTING EQUIPMENT
MAST CHUTE PLANTS
CONCRETE CARTS
CONCRETE BUCKETS AND CARS
CLAMSHELL BUCKETS
BIN GATES

NARROW GAUGE TRACK AND V-DUMP CARS

Write for Bulletins

THE LAKEWOOD ENGINEERING CO., Cleveland, Ohio

The New Omort All-Purpose Dump Truck and Road Builder

An All-Purpose Dump Truck and Road Builder

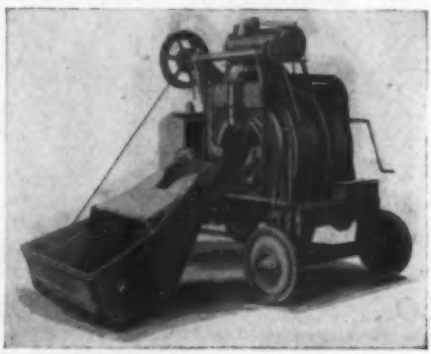
A NEW Omort all-purpose dump truck and road builder with an exclusive Omort end gate design whereby the operator of the truck can control the distribution and flow of materials entirely from the driver's seat, is made by the Greenville Mfg. Works, Greenville, Ohio. The body of the truck has 2½ cubic yards capacity with a double acting tail gate and center partition and is equipped with a hydraulic underbody hoist.

The engine is a Hercules Model OX with 4 cylinders, 4-inch bore 5-inch stroke and develops 46 horsepower. The full force feed lubrication with automatic control assures an ample oil supply to all bearings at all engine speeds. The cam shaft, water circulating pump, oil pump, generator and ignition timer are all gear driven. The engine has a removable head, and all working parts are thoroughly enclosed yet easily accessible for inspection or adjustment.

The transmission is the Fuller four forward speeds and one reverse, the fourth forward speed being an overdrive. The transmission power is augmented by further gears located in the clutch housing providing a two speed range either of which can, at the will of the driver, be engaged at any time, thus providing eight forward speeds and two reverse and making possible comparatively fast road travel with normal engine speed, yet retaining extremely powerful pulling qualities in the low speed range for difficult places. All gears are nickel steel and shafts are mounted on large annular ball bearings.

Improved Mixer With Many Features

AN improved one-bag mixer, the Marsh-Capron Master 7, has recently been announced by the Construction Machinery Co., 447 Vinton Street, Waterloo, Iowa. This Master 7, which has a number of new and improved features, is sturdy, compact and easily transported, with all moving parts enclosed. Among its features are Timken tapered roller bearings, spring-mounted wheels to absorb the shocks, interchangeable rubber tired and steel wheels, Diamond roller chain drive fully enclosed and running in oil, Marsh-Capron rail track and the accurate and easily operated 14-gallon Wonderquick water tank.

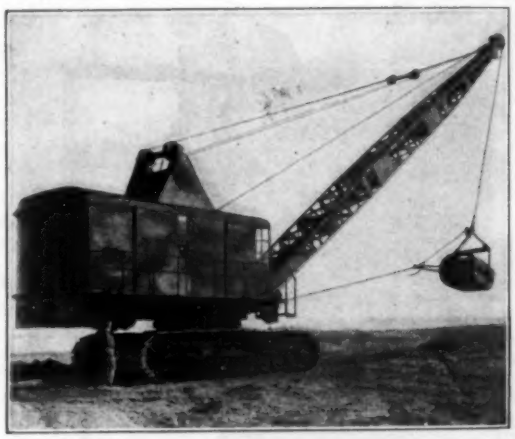


The New One-Bag Marsh-Capron Master 7 Mixer

The main frame is rigidly braced, hot riveted and electric welded throughout. The mixing drum is constructed of steel plate, electric welded. The charging opening is 23 inches in diameter and the discharge opening 18 inches in diameter. The six pick-up buckets and mixing blades are of heavy steel plate, scientifically designed and elevated from the drum to prevent building up and to facilitate mixing.

The power loader is of the improved pivoted type, with a closed end streamline skip. An automatic knockout releases the clutch and sets the brake.

Either a LeRoi 2-cylinder 6-7 horsepower hopper- or radiator-cooled engine or a 5-horsepower electric motor furnishes the power. The disc clutch is built integral with the engine and the shaft is mounted in self-aligning Dodge-Timken bearings.



The P & H 900 Dragline

A New 3½-Yard Excavator

A NEW 3½-cubic yard excavator has been announced by the Harnischfeger Corp., 38th and National Avenue, Milwaukee, Wis., and is known as Model 900. It is fully revolving and may easily be converted into shovel, dragline or crane.

The frame and carbody are of single piece annealed steel castings, fully machined at the bearing points. It is equipped with roller bearings throughout the main machinery, and the swiveled conical steel swing rollers, which carry the weight of the revolving structure, are also provided with anti-friction roller bearings. All gears are fully enclosed in steel gear cases, run in an oil bath and the bearings are provided with bronze bushings.

The new excavator is equipped with a box girder shovel boom, outside dipper sticks and a 3-yard dipper, as well as a bucket for dragline work. It is mobile and easily operated, and in general design, similar to the other P & H machines.

A Heavier Duty Crawler

THE Warco crawler made by W. A. Riddell Co., Dept. F, Bucyrus, Ohio, has been improved in the 1929 model. It is a heavier duty crawler than before, longer, giving more traction with a greater range of speed, with more service on the ground and a larger bearing surface. It is being built in rear crawler and full crawler types and is interchangeable for all McCormick-Deering tractors.

STEEL SHEET PILING

Bought. Sold. Rented

WEMLINGER INC.

Service, Technical advice, Stocks on hand everywhere.

149 BROADWAY NEW YORK

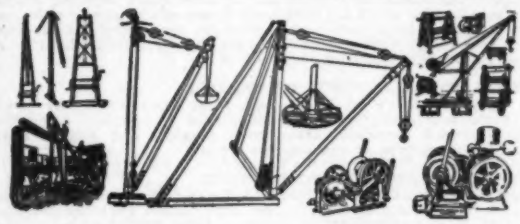
HIGH QUALITY—*Ask for Bulletin A*—LOW COST

Gasoline
Electric
Single Drum
Double Drum

STERLING HOISTS

with Timken Roller Thrust Bearings and Asbestos Frictions

Sterling Machinery Corporation
General Offices 2303-7 Holmes St.
KANSAS CITY, MO.



We have a complete line of Derricks and Winches

SASGEN DERRICK CO.
3101 Grand Ave. Chicago, Ill.

More Light *for* Less Money

Do you investigate the operating costs of your emergency lighting? Some lights cost 6c to 11c an hour for 8000 candlepower. The Milburn furnishes 8000 candlepower for only 3½c an hour.

Contractors who closely investigate operating costs report important savings through the use of the Milburn Light. Patented features, exclusive with the Milburn Light, are responsible for these savings.

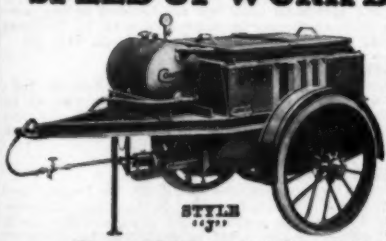
Write for information as to the EIGHT POINTS which will help you save money with Milburns.

Stocked in warehouses in all sections.

Ask for booklet No. 223-3 on "Lights" and 323-3 on "Welding and Cutting Apparatus."

THE ALEXANDER MILBURN COMPANY
1416-1428 W. Baltimore St., Baltimore, Md.

SPEED UP WORK BY USING



a Connery Style "J" oil-burning kettle. Here's a kettle that answers all requirements:—low fuel cost, quick heating, roller-bearing wheels and springs, absolute temperature control and solid rubber tires if desired.

We manufacture a full line of Tar and Asphalt Kettles, Oil Burning Kettles, Oil Burners, Torches, Pouring Pots, Hand Spraying Attachments, etc. Send for "Blue Book" describing our equipment.

Connery & Company, Inc.
4000 N. Second Street, Philadelphia, Pa.

Hayward Buckets

—HAYCO—

Let Hayward Engineers recommend a bucket to fit the job. The Hayward line includes Clam Shell, Orange Peel, Drag Line and Electric Motor Buckets; Dredging, Excavating and Coal Handling Machinery; Automatic Take-up Reels; Counterweight Drums.

THE HAYWARD COMPANY
32-36 Dey Street New York, N. Y.

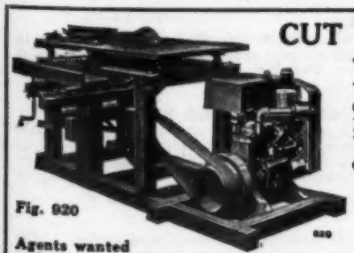


Fig. 920

Agents wanted for open territory

CUT YOUR COSTS

This portable woodworker often saves its cost on a single job. 14 machines in one. Your own shop right on the job. Quick work at less cost. Cut your bids—win more jobs. Ask about our saw rigs and hoists.

AMERICAN
SAW MILL MACHINERY CO.
MAKERS OF WOODWORKING AND SAW MILL MACHINERY
171 Main Street Hackettstown, N. J.

Simplex Jacks

for Industries-Utilities-Railways-
Oil Wells-Mines-Engineering-Contractors-

Simplex Lever Jacks-Pipe Pushers-Trench Braces-
Simplex Screw Jacks-with the Visible Screw-

Distinctive in Man Power, Safety & Simplicity

Templeton, Kenly & Co., Chicago, U.S.A.
The World's Largest Manufacturers of Jacks
Baldwin Locomotive Works, Foreign Representative

Simplex Screw Jack with the Visible Screw

READ OVER THIS LIST IT WILL HELP YOU

These especially selected catalogs and pamphlets of value to contractors are for free distribution.

You will find it worth while to check these lists each month and write for the catalogs you need.

A HANDBOOK OF POWER SHOVEL OPERATION

The Thew Shovel Co. (Joe L. Beltz, Adv. Mgr.), Lorain, Ohio, has issued a handbook on the operation, care, adjustment and application of power shovels and excavating machines. This loose-leaf book which will be added to from time to time, is primarily an instruction book covering Lorain machines, but, in addition, it has much information on the general handling, unloading, loading, etc., of this type of equipment, as well as numerous tables and other miscellaneous data of interest to any contractor, estimator or engineer.

A VOLUME-MEASURING BIN

A recent folder of the Superior Engineering Co. (J. H. Gwynne), Warren, Ohio, describes fully the batcher meters for measuring by volume and which are made in a number of sizes and types for any possible need.

MECHANICAL DISTRIBUTORS FOR ROAD WORK

A recent 16-page booklet describing the Big Sandy and Handy Sandy mechanical distributors for road surfacing which are made in a number of models to suit various needs may be secured by any one interested from Highway Service, Inc. (Milton Burghardt, Gen. Sales Mgr.), New Bedford, Mass.

AGITATOR BODIES FOR HAULING CONCRETE

A rotary body for transporting mixed concrete has been developed by the Avril Tru-Batch Concrete Co. (Arthur Avril, Pres.), Cincinnati, Ohio, in corroboration with the LeBlond-Schacht Truck Co., of Cincinnati, and is completely described and illustrated in a folder which will be sent on request.

STEEL ROAD FORMS

The Heltzel Steel Form & Iron Co. (W. J. Savage, Vice-Pres.), Warren, Ohio, has issued an 8-page folder describing the new Heltzel 1930 Armor Plate road forms made in 10-foot lengths and heights of 6, 7, 8, 9, 10 and 12 inches which can be used in connection with the old type Heltzel road forms.

A THREE-WAY DUMP TRAILER WITH CRAWLER WHEEL

Bulletin No. 102 issued by the Athey Truss Wheel Co. (J. A. Roberts, Secy. & Treas.), 130 N. Wells St., Chicago, Ill., describes the new Athey Truss-Wheel 3-way dump trailer which is made in 4 or 5-yard capacity on a 10-ton chassis, or 7 to 8-yard capacity on a 15-ton chassis, the body dumping to right, left or to the rear and controlled entirely by the tractor operator.

A SMALL PORTABLE INDUSTRIAL CRANE

A small portable industrial crane mounted on a 10-20 McCormick-Deering tractor with which loads up to three thousand pounds are lifted, moved and spotted exactly where they are needed in minimum time, is described and illustrated in a folder which may be secured on request from the Trackson Co. (L. E. Dauer, Sales Mgr.), 519 Clinton Street, Milwaukee, Wis.

MOLE DRAINAGE

Form A-141 and a descriptive catalog of the Killefer Mfg. Co. (R. P. Lehr, Adv. Mgr.), 5525 Downey Road, Los Angeles, Calif., give complete data and illustrations of Killefer tools for mole drainage for airports and road construction where the soil has sufficient clay content to permit the formation of a tunnel by an implement known as a mole.

A TWIN CYLINDER PORTABLE CENTRIFUGAL PUMP

The Evinrude Motor Co. (Hugo Biersach, Sales Mgr.), Milwaukee, Wis., has recently developed the Twin Evinrude centrifugal pump powered with an Evinrude 6-horsepower Fleetwin motor, which has a large capacity for all work where a portable pump is required.

MEDIUM WEIGHT HEATER FOR ASPHALT TANK CARS

Complete information and prices on a new light-weight heating system arranged for easy and speedy transportation which has been developed by E. D. Etnyre & Co. (George Etnyre), Oregon, Ill., will be sent on request.

NEW SCARIFIER FOR 10-TON GAS ROLLERS

The Huber Mfg. Co. (A. W. Newby, Asst. Secy.), 330 E. Center Street, Marion, Ohio, has recently designed a scarifier for its 10-ton gasoline roller in which the cylinder is located under the deck of the roller where it is out of the way and pressure is applied to the scarifier bar through bell arms and levers.

NEW TRUCK BODY FOR READY-MIXED CONCRETE

A new ready-mixed concrete truck body has been developed by C. O. Bartlett & Snow Co. (Sam Gertz), 6200 Harvard Ave., Cleveland, Ohio, which is made with its two sides movable to correct any segregation in the concrete. Bulletin 62 of this company contains descriptions and illustrations of this body.

HIGHWAY EQUIPMENT

The General Wheelbarrow Handbook No. 107 and the new booklet Highway Equipment describing the complete line of equipment for the road building and general contractor may be secured from the General Wheelbarrow Co. (W. A. Gordon, Sales Mgr.), 3140 East 65th Street, Cleveland, Ohio.

NEW GATE FOR THREE-COMPARTMENT BINS

The Blaw-Knox Co., (D. C., Grove, Adv. Mgr.), 667 Farmers Bank Bldg., Pittsburgh, Pa., will be glad to send to interested contractors complete information and prices regarding the new Triplex gate which is so devised that the operator can operate any one of the three gates of a three-compartment aggregate bin independently of the others from one position.

A HEAVIER DUTY CRAWLER

Complete information and prices on the 1929 model improved heavier duty Warco crawler which has been made longer, giving more traction and greater range of speed with more service on the ground and a larger bearing surface, may be secured from the W. A. Riddell Co. (W. A. Riddell, Pres.), Bucyrus, Ohio.

BUCKETS FOR ALL TYPES OF SERVICE

The Hayward Co. (H. C. Ryder, Asst. Sales Mgr.), 32-36 Dey Street, New York, will send to any one interested a complete description of the Hayward clamshell, orange-peel, dragline and electric motor buckets for every type of construction service.

A STURDY DEPENDABLE POWER UNIT

Sturdy and dependable engines and heavy-duty power units which are used in a variety of ways in the construction field are described in information which may be secured from the Hercules Motors Co. (John Keplinger, Dir. of Sales), Canton, Ohio.

HIGHWAY MACHINERY TRAILERS

The Highway Trailer Co. (H. W. Helms, Gen. Mgr.), Edgerton, Wis., will be glad to send to those interested complete data and prices of its heavy-duty trailers for transporting highway machinery of all kinds.

A NEW OIL BURNING HEATER

Pamphlet 15 describes in detail the new Honhorst oil burning tar heater and may be secured from the Jos. Honhorst Co. (L. A. Hess, Adv. Mgr.), 1016 West 6th Street, Cincinnati, Ohio.

A HANDY HEATING TORCH

An adjustable and speedy heating torch with a 14-inch flame which concentrates intense heat and speeds up work and can be used in any position is described in a pamphlet which may be secured from G. H. Williams Co. (A. J. Lichtinger, Asst. Sales Mgr.), 609 Haybarger Lane, Erie, Pa.

A NEW ASPHALT PATCHING PLANT

The Chausse Oil Burner Co. (Wm. McK. White, Pres.), Elkhart, Ind., will be glad to send to any one interested a complete description of its new asphalt street repair or patching plant, known as Model H-1 and designed to meet the demand for a self-contained patching plant with modern oil burners and at a moderate price.

EXCAVATOR HAS MANY USES

The General Excavator, which is designed and built for lengthy and dependable service as a shovel, clamshell, dragline, backhoe, skimmer, crane or backfiller, is full revolving, made in one size and can easily be converted from one service to the other is described in literature of the General Excavator Co. (F. B. Morrison, Sales Mgr.), 200 Rose Street, Marion, Ohio.

A TWO-DUTY DIAPHRAGM PUMP

Bulletins describing the Model 164 two-duty diaphragm pump which is so designed that it can be used as an open spout discharge pump or a force discharge pump as desired, may be secured from the Domestic Engine & Pump Co. (W. E. Barbour, Sales Mgr.), Shippensburg, Pa.

HOW TO CURE CONCRETE

This is the title of a booklet describing the use of Dowflake in the mixing of concrete as a curing and accelerating agent which may be secured from the Dow Chemical Co. (Donald Williams, Asst. Sales Mgr.), Midland, Mich.

PORTABLE BINS WITH VOLUME-WEIGHING DEVICES

Data and prices on Erie Aggremeter plants, which are bins of either one or two pieces equipped with the new combination volume-weighing Aggremeters for proportioning aggregates will be sent to those interested by the Erie Steel Construction Co. (R. E. Daub, Adv. Mgr.), Erie, Pa.

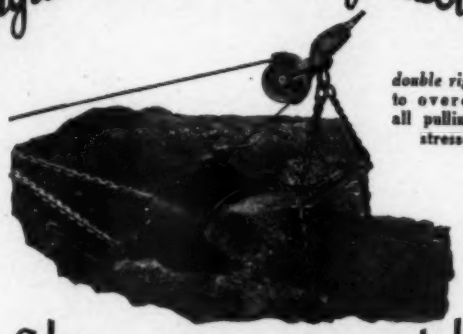
A NEW HOIST

The Flor-Ox 35, a new hoist with roller-bearing thrusts for friction clutches, less weight and space, positive release device on the friction levers, silent chain drive in a dust-proof casing, machine-cut teeth on all the main gears and pinions, and a rope pull of 5,000 pounds at 165 feet per minute, with either a gasoline or an electric motor, is described in a recent bulletin of the S. Flory Mfg. Co. (E. G. Markley, Gen. Mgr.), Bangor, Pa.

SINGLE AND DOUBLE DIAPHRAGM PUMPS

The new Rex single and double diaphragm pumps, the design of which includes the bowl method of changing the diaphragm, enclosed gears running in oil, simplified grease system and up-to-date trailer, are described in Bulletin 176 of the Chain Belt Co. (R. A. Shilbauer, Adv. Mgr.), 766 Park Street, Milwaukee, Wis.

A rigid cast-steel bridge above—



double rigidity to overcome all pulling-in stresses

a heavy steel digging lip below

USE THE WILLIAMS "DOUBLE-ARCH" DRAGLINE—the bucket that has the strength and stamina to stand years of hard digging without drawing in at the sides.

Correct distribution of weight to give greatest digging power for each job—your WILLIAMS "Double-Arch" Dragline cuts at the right angle and bites right in, the instant the drag cable is taut.

Glad to send you our Bulletin "DS-1" which gives many other reasons why the WILLIAMS "Double-Arch" Bucket gives you better results in dragline work.

And in the complete WILLIAMS line of Clamshell Buckets, there's one especially designed to do your excavating or rehandling—"Built to Dig, and Last While Digging."

G. H. WILLIAMS COMPANY

609 Haybarger Lane, Erie, Pa.

Branch Offices: New York, Pittsburgh, Chicago

WILLIAMS

FAST-DIGGING BUCKETS

When road work opens this spring—

Be ready with dependable equipment which will do the work in the quickest way . . . which can be used under all conditions . . . which will do the hard job and the easy one.

Warco road machinery is your best bet—it has the stuff—try it out and be convinced.

The Warco model KM Alwatrac speeds up road work for a drawn grader.

The new 1929 Warco 10R Road Hog doing a job of ditching.

The Warco Wheeled Scoop, operated singly or in trains, levels the ground and spreads the dirt evenly or dumps it in a pile.

Spinning the freely turning wheels in the cab, operates the screw through the circle controls, and easily raises and lowers the grader blade.

The Warco Screw Lift.

"Built like a Screw Jack"

Warco PRODUCTS

W. A. RIDDELL CO. BUCYRUS, OHIO

A NEW WAY TO CUT CABLE
A new cable cutter which whips and cuts any size cable up to one inch in less than a minute, which leaves the cut ends encased in a steel band with no frayed edges and all ready to pass through fittings and fixtures, and is easily carried in a kit which only weighs 8 pounds, is manufactured by the Morse-Starrett Products Co. (I. J. Morse), 1916 Broadway, Oakland, Calif., who will send data and prices on request.

EQUIPMENT FOR WINTER CONSTRUCTION
The Aeroil Burner Co. (George P. Kittel, Pres.), West New York, N. J., will be glad to send to those interested catalogs containing a complete description of heaters for concrete mixers, salamanders, thawing torches, mortar and water heaters, car thawing outfits, asphalt heaters and other equipment for use in winter construction.

A PROCESS FOR CURING CONCRETE
An illustrated booklet "Curing Concrete Without Dirt and Water by the Hunt Process" which contains a description of the process as well as other valuable data, details of tests and other information about curing concrete, may be secured from McEverlast, Inc. (A. M. Shenk, Pres.), 1110 Board of Trade Bldg., Los Angeles, Calif.

HIGH SPEED HOISTS FOR ELEVATOR WORK
Bulletin S describes in detail Lidgerwood high speed hoists for elevator work, which raise 1,500 pounds at 500 feet per minute, and may be secured from the Lidgerwood Mfg. Co. (S. S. Williamson, Adv. Mgr.), Elizabeth, N. J.

MORE LIGHT FOR LESS MONEY
The eight features of the Milburn lights which make for better construction job lighting at lower operating costs are described in booklet No. 223-2 on "Lights" which may be secured from the Alexander Milburn Co. (A. F. Jenkins, Pres.), 1416-1428 West Baltimore Street, Baltimore, Md.

HOISTING ENGINES
The J. S. Mundy Hoisting Engine Co., 722-40 Frelinghuysen Avenue, Newark, N. J., will be glad to send any one interested its catalog describing the Mundy hoisting engine for steam, gas and electric hoists, dredge hoists, belt hoists, ship, cargo and dock winches, capstans and cableways.

ACCURATE WATER METERS
A complete description of the Neptune-built water meters, which are gaged and tested for absolute accuracy may be secured from the Neptune Meter Co. (H. W. Ballantine, Treas.), 50 East 42nd Street, New York.

A REINFORCED CONCRETE PIPE
The Newark reinforced concrete pipe which has a minimum resistance to flow because the inside of the joint is so smooth, is described in literature of the Newark Concrete Pipe Co. (F. H. Sherrerd, Gen. Mgr.), 462 Broad Street, Newark, N. J.

DERRICKS AND WINCHES
The Sasgen Derrick Co., 3101 Grand Avenue, Chicago, Ill., will send complete information and prices on its complete line of derricks and winches to those interested.

CALCIUM CHLORIDE IN CONCRETE CONSTRUCTION
Booklet No. 2053 "Solvay Calcium Chloride in Concrete Construction" describes the use of Solvay calcium chloride in curing concrete and may be obtained from the Solvay Sales Corp. (W. I. Galliher, Mgr. Special Products Section), 40 Rector Street, New York.

NEW ENGINE MODELS
Bulletin No. 710 "What's New with Waukesha?" contains a complete description of the new Waukesha engine models for automotive and industrial use and may be secured from the Waukesha Motor Co. (P. C. Ritchie, Adv. Mgr.), Waukesha, Wis.

WIRE ROPE FOR SAFETY
Wire rope which has the grade marked with Telfax tape in the hemp core to insure the use of the right kind of rope for your service is manufactured by the Williamsport Wire Rope Co. (C. M. Ballard, Sales Mgr.), Peoples Gas Bldg., Chicago, Ill., who will send complete information on request.

A NEW BELT FEEDER
The Barber-Greene Co. (James H. Gregory, Publicity Mgr.), Aurora, Ill., will be glad to send to any one interested complete information in regard to its new belt feeder which may be used for unloading material transported in hopper-bottom cars without digging a pit under the railroad tracks and which may be driven by either an electric motor or a gasoline engine.

A ⅜-YARD TRACTOR SHOVEL
Bulletin T-5 contains a complete description of the Bay City ⅜-yard tractor shovel, which can handle heavy and difficult jobs and yet is easily moved from one job to another, and may be secured from the Bay City Shovels, Inc. (W. S. Ramsey, Pres.), Bay City, Mich.

COPPERSTEEL BINS FOR STORAGE
The Beaumont coppersteel storage bins which are made entirely of copper bearing steel plates to insure long life, have rigid construction, are bolted throughout, are easily portable, with full gravity discharge, ample truck clearance, easy erection and made in standard sizes to meet all possible requirements are described in Catalog 100 of the Beaumont Mfg. Co. (W. G. Davenport, Mgr., S. G. S. Dept.), 330 Arch Street, Philadelphia, Pa.

ALL-STEEL HAND HOISTS
Beebe Brothers (R. T. Beebe, Pres.), 3219 First Avenue, So., Seattle, Wash., will send to those interested complete information in regard to the Beebe all-steel hand hoists which weigh 110 pounds, have a 5-ton straight line capacity, two speeds, 4 to 1 and 24 to 1, and a positive internal brake.

A COMPLETE LINE OF ROAD ROLLERS
An illustrated booklet describing in detail the complete line of Buffalo-Springfield road rollers, either steam or motor driven in all practical sizes, may be secured from the Buffalo-Springfield Roller Co. (J. F. Richardson, Sales Mgr.), Springfield, Ohio.

A NEW ALL-STEEL CONCRETE MIXER
A new all steel concrete mixer, the Leach 5-S, among the features of which are the welded splash plate, electrically welded frame, one man lever control, power side loader and only 6 moving bearings, is described in Bulletin A which the Leach Co. (E. C. Leach, Pres.), Oshkosh, Wis., will be glad to send to those interested.

A NEW ½-YARD FULL REVOLVING SHOVEL
Catalog No. 54 of the Insley Mfg. Co. (Carl S. Wagner, Sales Mgr.), Indianapolis, Ind., contains a complete description of the Insley Type R shovel, ditcher, skimmer scoop, crane, dragline, among the features of which are the cast steel underframe, cast steel car body, steel-cut gears, roller and ball thrust bearings, one-shot lubrication of crawlers and hydraulic brakes.

A COMBINATION MELTING FURNACE AND TORCH
A combination melting furnace and torch which is mounted on wheels and burns either kerosene or coal oil is described in Sheet No. 101 which may be secured from the Hauck Manufacturing Co. (F. J. Schwenck, Sales Mgr.), Brooklyn, N. Y.

NEW ROAD JOINT MACHINES
A new 36-page booklet of the Flexible Road Joint Machine Co. (J. N. Heltzel, Pres.), Warren, Ohio, contains complete information in regard to the flexible road joint machine and its uses as applied to new concrete, resurfacing, construction of concrete base courses, flexible top and brick surfaced roads.

A NEW POWER-OPERATED BULLDOZER
A new power-operated bulldozer for the Cletrac 30-A which attaches to the standard Cletrac extended axle and in which is incorporated a number of new features is described in a recent announcement from the Miami Trailer-Scraper Co. (E. T. Smith, Sales Mgr.), Troy, Ohio.

A NEW TYPE OF DIFFERENTIAL
A booklet describing the Krohn Kompensator, a differential which compensates for the difference in rotative speed between the driving wheels, as well as the difference in tractive ability between the wheels, may be secured from the Krohn Differential Corp. (W. G. Farnsworth, Pres.), 209 South La Salle St., Chicago, Ill.

GREATEST TUNNEL ACHIEVEMENT OF THE AGE
This is the title of a pamphlet published by the Consolidated Expanded Metal Cos. (Thomas R. Herbest, Jr., Vice-Pres.), Wheeling, West Va., which describes the use of Steelcrete mesh reinforcements in the construction of the Holland Vehicular Tunnel.

ELECTRIC STEEL CASTINGS
The Geo. H. Smith Steel Casting Co. (L. E. Dauer, Sales Mgr.), Milwaukee, Wis., will be glad to send to those interested a copy of the new catalog "The Story of Smithco Steel Castings" which describes the production and uses of the small high-grade electric steel Smithco castings.

DUMP TRUCKS FOR CONSTRUCTION HAULING
A 40-page booklet recently published by the Autocar Co. (Robert F. Wood, Adv. Mgr.), Ardmore, Pa., contains a detailed description of the many features and uses of the Autocar dump trucks as found by their many owners from actual work and experience with Autocars.

A ROTARY BLADE PIPE CUTTER
A circular describing the Ellis pipe cutter which has six rotary cutting blades which go through ordinary pipe in one cut may be secured from the Ellis & Ford Mfg. Co. (Herman A. Sperlich, Pres.), 32 Piquette Avenue, Detroit, Mich.

STEEL FOR CONSTRUCTION EQUIPMENT
Dependable cast steel which is used for bucket pins, lips, fronts bushings, teeth, conveyor buckets, crawler wheels and shoes, rollers, sprockets, sheaves, gears and pinions, pump casings and other parts requiring dependable and sturdy performance is described in literature which the Farrell-Cheek Steel Foundry Co. (C. C. Hottmann, Sales Dept.), Sandusky, Ohio, will be glad to send to those interested.

CONCRETE ROAD FINISHERS
A. W. French & Co., 8440 Lowe Avenue, Chicago, Ill., will be glad to furnish any one interested with complete data and prices of the Ord concrete road finisher with its double sliding screed for finishing concrete.

ALL-STEEL DUMP BODIES
Complete information in regard to the Galion all-steel hand hoist, gravity and hydraulic dump bodies which are economical, efficient and long-lasting, may be obtained from the Galion Allsteel Body Co. (B. J. Heiser, Adv. Mgr.), Box 15, Galion, Ohio.

A FULL-REVOLVING GAS SHOVEL
A versatile, speedy, full-revolving and easily moved gas shovel with a capacity of ¾-yard and known as Model OF is described in a pamphlet which may be secured from the Universal Power Shovel Co. (C. B. Buoy, Sales Mgr.), 15841 Second Blvd., Detroit, Mich.

A TRAILER CHIP SPREADER
A husky chip spreader of the trailer traction type, designed with removable side wing pans and also adjustable for use with various height trucks, is described in Bulletin KC8 which may be secured from the Good Roads Machinery Co. (J. Warren Kitts, Adv. Mgr.), Kennett Square, Pa.

WHAT'S IN THE SPEED CRANE
This is the title of a booklet describing the features and the uses of the Moore Speedcrane which may be secured from the Manitowoc Engineering Works (C. C. Miller, Sales Dept.), Manitowoc, Wis.

A SPEEDY HEAVY DUTY PAVER
The Koehring Co. (O. C. Dahlman, Adv. Dept.), Milwaukee, Wis., will be glad to send to those interested a copy of its 16-page booklet describing the new 1929 model of the 27-E Koehring paver which with the automatic mixing cycle and one minute mixing period charges, mixes and discharges in 69 seconds.